

PAYMENT BOND

_____, as principal, hereinafter called Contractor, and, _____ as Surety, with general offices in _____, a corporation organized under the laws of the State of _____, and authorized to transact business in the State of Colorado, are hereby bound unto the City of Commerce City, Colorado, as obligee, hereinafter called the City, in the penal sum of _____ dollars (\$_____) with interest thereon at the rate of eight percent per annum on all payments becoming due in accordance with the below designated Contract from the time such payment shall become due until such payment shall be made, in United States currency, for the payment of which sum Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally.

WHEREAS, Contractor has entered into a written Contract with the City dated _____, 20___, for _____ in accordance with Contract Documents contained in the Contract, a copy of which Contract is attached hereto and made a part hereof and is hereinafter referred to as the Contract;

NOW, THEREFORE, the conditions of this Payment Bond are such that, if Contractor shall at all times promptly make payments of all amounts lawfully due to all persons supplying or furnishing it or its Subcontractors with labor or materials, rental machinery, tools or equipment used or performed in the prosecution of the work provided for in the Contract and shall indemnify and save harmless the City to the extent of any payments in connection with the performance of such Contracts that the City may be required to make under law, then this obligation shall be null and void; otherwise the obligation shall remain in full force and effect.

In addition to the other conditions hereof, this Bond shall include all provisions set forth in Section 38-26-105, C.R.S.

THE UNDERSIGNED SURETY for value received hereby agrees that no extension of time, change in, addition to, or other modification of the terms of the Contract or work to be performed thereunder or of the Specifications of the Contract Documents shall in any way affect its obligation on this Bond, and the Surety does hereby waive notice of any such extension of time, change, addition, or modifications.

Any action against the Surety on this Bond shall be brought no later than two years from the date fixed for final settlement of the Contract.

Signed and sealed this _____ day of _____, 20___.

Contractor: _____ **Surety:** _____

By: _____ **By:** _____

Its: _____ **Its:** _____

Address for Notices: _____

Attest: _____

PERFORMANCE BOND

_____, as principal, hereinafter called Contractor, and _____, as Surety, with general offices in _____, a corporation organized under the laws of the State of _____, and authorized to transact business in the State of Colorado, are hereby bound unto the City of Commerce City, Colorado, as obligee, hereinafter called the City, in the penal sum of _____ Dollars (\$_____), in United States currency, for the payment of which sum Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally.

WHEREAS, Contractor has entered into a written contract with the City dated _____, 20____, for _____ in accordance with Contract Documents comprising the Contract, a copy of which Contract is attached hereto and made a part hereof and is hereinafter referred to as the Contract;

NOW, THEREFORE, the conditions of this Performance Bond are such that, if Contractor shall satisfactorily perform the Contract, the obligations hereunder shall be null and void; otherwise, the obligations shall remain in full force and effect. Whenever Contractor shall be declared by the City to be in default under the Contract, the City having performed the City's obligations thereunder, the Surety may promptly remedy the default or shall promptly

Complete the Contract in accordance with its terms and conditions, or

Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the City elects, upon determination by the City and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and the City, and make available as Work progresses (even though there should be a default or a succession of defaults under the contracts of completion arranged under the paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the City to Contractor under the Contract and any amendments thereto, less the amount properly paid by the City to Contractor.

In addition, if Contractor or its Subcontractor shall fail to duly pay for any labor, materials, team hire, sustenance, provisions, provender or other supplies used or consumed by such Contractor or its Subcontractor in performance of the Contract or shall fail to duly pay any person who supplies rental machinery tools or equipment all amounts due as the result of the use of such machinery tools or equipment in the prosecution of the work, then the Surety shall pay the same in an amount not exceeding the sum specified in the Bond together with interest at a rate of eight percent per annum.

In addition to the other conditions hereof, this Bond shall include all provisions set forth in Section 38-26-106, C.R.S.

THE UNDERSIGNED SURETY for value received hereby agrees that no extension of time or change in, addition to or other modification of the terms of the Contract or work to be performed

thereunder or of the Drawings, Plans/Specifications or any other Contract Document shall in any way affect its obligation on this bond, and the Surety does hereby waive notice of any such extension of time, change, addition, or modifications.

Any action against the Surety on this Bond shall be brought no later than two years from the date fixed for final settlement of the Contract.

Signed and sealed this _____ day of _____, 20____.

Contractor: _____

Surety: _____

By: _____

By: _____

Its: _____

Its: _____

Address for Notices: _____

Attest: _____



7887 East 60th Avenue
 Commerce City, Colorado 80022
 Phone (303) 289-3627
 Fax (303) 289-3661
www.c3gov.com

EQUIPMENT DECLARATION

Company: _____ Date: _____
 Address: _____ Job Address: _____
 State and Zip: _____

Note: Construction equipment that was not otherwise subjected to the Commerce City sales or use tax, and which is located within the boundaries of the City of Commerce City for a period of thirty (30) consecutive days or less, shall be subjected to the use tax of Commerce City on a prorated basis if the equipment is declared in advance. **If the equipment is not declared in advance or is located within the City for over thirty (30) consecutive days, the amount of tax due will be calculated on 100% of the original purchase price.**

The tax on Declared Equipment shall be calculated using the following method: **The original purchase price of the equipment shall be multiplied by a fraction, the numerator of which is one (1) and the denominator which is twelve (12); and the result shall be multiplied by four and one-half percent (4.5%) to determine the amount of Use Tax payable to the City.** (Example: thirty (30) days or less = $1/12 \times$ purchase price of the equipment \times 4.5%)

In order for a taxpayer to qualify for this exemption, the taxpayer must comply with the procedures described in Section 29-2-109(4) of the Colorado Revised Statutes by completing this form and remitting the tax due to the Finance Department of the City of Commerce City. **If the taxpayer does not file this form the exemption herein provided for shall be deemed waived by the taxpayer.**

A separate declaration form must be used for each individual piece of equipment.

Construction Equipment Declared:

Description of Equipment and/or VIN number: _____
 Purchase price of above equipment and date purchased: _____
 Date equipment will enter the City: _____
 Date equipment will be removed from the City: _____

CITY OF COMMERCE CITY

GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS, ABBREVIATIONS & REFERENCES

1.1. Definitions.

Whenever used in the Contract Documents, the following terms shall have the following meanings, applicable to both the singular and plural, in addition to words otherwise defined in the Contract Documents:

- 1.1.1. **Addenda:** Written changes to the Bidding Documents issued before the opening of Bids that clarify, correct, or change the Contract or change the date set for the Opening of Bids.
- 1.1.2. **Bonds:** Bid Bonds, Performance Bonds, and Payment Bonds, any warranty bond, or other instruments of security furnished by the Contractor and its Surety according to the Contract.
- 1.1.3. **Change Order:** A written modification of the Contract, issued after award to the Contractor, authorizing an addition, deletion, or revision in the Work within the general scope of the Contract or authorizing an adjustment in the Contract Price or Contract Time mutually agreed upon between the City and the Contractor.
- 1.1.4. **City or Owner:** The City of Commerce City, Colorado. Any reference to the approval, decision, or discretion of the City, whether express or implied, is a reference to the approval, decision, or discretion of the City Manager, or to his or her designee unless otherwise stated or required by law.
- 1.1.5. **Completion Date:** The date the Contract specifies the Work is to be completed.
- 1.1.6. **Construction Schedule:** The schedule of Work approved by the City in accordance with the Contract Documents.
- 1.1.7. **Contract:** The construction contract for the completion of the Work consisting of the Construction Contract Agreement and all other Contract Documents.
- 1.1.8. **Contract Documents:** All the documents expressly incorporated into the Contract by and including the Construction Contract Agreement, including without limitation all Addenda, Bid Forms, Change Orders, Plans/Drawings, General Conditions, Request for Bids (including all attachments), insurance certificates, Notice of Intent to Award, Notice of Final Acceptance, Notice to Proceed, Notice of Substantial Completion, any Performance Bonds, any Payment Bonds, Special Conditions, accepted Shop Drawings, and Specifications.
- 1.1.9. **Contract Price:** The total monies payable to the Contractor under the terms and conditions of the Contract.
- 1.1.10. **Contract Time:** The number of days provided in the Contract for the completion of the Project from the date of the Notice to Proceed through and including the date of Final Acceptance. The Contract Documents may require completion on or before a certain specified date.

- 1.1.11. **Contractor:** The person or entity identified in the Construction Contract Agreement contracting with the City to perform the Work required by the Contract.
- 1.1.12. **Drawings or Plans:** The part of the Contract prepared or approved by the Project Manager showing the characteristics and scope of the Work to be performed.
- 1.1.13. **Date of Contract:** The execution date in the Agreement for a Construction Contract unless otherwise specified.
- 1.1.14. **Day or day:** A calendar day of twenty-four hours each from midnight to midnight, unless otherwise specified.
- 1.1.15. **Field Order:** A written order issued by the Project Manager to the Contractor during construction that directs the Contractor to commence a change in the Work before complete agreement on or execution of a Change Order.
- 1.1.16. **Final Acceptance:** The City's final acceptance of the Work completed according to the Contract requirements with all parts of the Work in good condition and in working order, including completion of all punch list items, cleanup work, and delivery of all required guarantees, warranties, licenses, releases, and other deliverables.
- 1.1.17. **Final Payment:** The final and complete payment to the Contractor in accordance with the Contract Documents.
- 1.1.18. **Inspector:** The City's authorized representative assigned to make detailed inspection of the Work performed by the Contractor.
- 1.1.19. **Notice of Final Acceptance:** The written notice of the date, as certified by the City, of Final Acceptance.
- 1.1.20. **Notice to Proceed:** The written notice by the City to the Contractor authorizing the Contractor to proceed with the Work.
- 1.1.21. **Notice of Substantial Completion:** The written notice of the date, as certified by the City, of Substantial Completion.
- 1.1.22. **Parties:** The City and the Contractor.
- 1.1.23. **Project:** The total construction of which the Work to be provided under the Contract Documents may be the whole or a part as indicated elsewhere in the Contract Documents and may include construction by other contractors.
- 1.1.24. **Project Manager:** The City's designated, authorized representative assigned to the Project with day-to-day responsibility for managing the Contract.
- 1.1.25. **Reasonably Predictable Weather Days:** Estimated Weather Day(s) where critical path activities cannot be performed in any month, within contract weather or temperature limitations, or due to weather related soil conditions.
- 1.1.26. **Shop Drawings:** All drawings, diagrams, illustrations, brochures, schedules, and other data prepared by the Contractor, any Subcontractor, manufacturer, Supplier or distributor that illustrate how specific portions of the Work will be fabricated or installed.

- 1.1.27. **Special Conditions:** Additions to the General Conditions containing instructions and conditions peculiar to an individual Project.
- 1.1.28. **Specifications:** A part of the Contract Documents consisting of written technical description of materials, equipment, construction systems, standards, and workmanship.
- 1.1.29. **Subcontractor:** Any person or entity having a subcontract with the Contractor (or any Subcontractor, of any tier, whether or not authorized by the Contractor) to furnish and perform work at the Work site, including the provision of labor, materials, equipment, supplies, tools, services, or any combination of these. This definition shall not limit the Contractor's obligations, or alter any Subcontractor's rights, under any law or contract.
- 1.1.30. **Substantial Completion:** The date on which the Work has progressed to the point that the City can beneficially occupy or utilize the Work for the purpose for which it is intended, and the Work complies with all applicable codes and regulations, including, if required, issuance of a certificate of occupancy, or certificate of suitability for use from the appropriate governmental agencies, as determined by the City in its sole discretion.
- 1.1.31. **Superintendent:** The Contractor's authorized representative assigned to the Project with day-to-day responsibility for managing the Project.
- 1.1.32. **Supplier:** Any person or organization who supplies materials, supplies, tools, equipment, or other items for the Work, including those fabricated to a special design, but who does not perform labor at the site. This definition shall not limit the Contractor's obligations, or alter any Supplier's rights, under any law or contract.
- 1.1.33. **Surety:** Any entity that is bound with and for the Contractor for the performance of the Work and/or the payment for any labor and material through the performance bond and/or the payment bond.
- 1.1.34. **Unit Price:** An amount stated in the Bid as a price per unit of measurement for materials or services as described in the Contract. Unit Prices are intended to cover all items of work to be done and materials to be furnished to fully complete the Work in accordance with the Contract Documents (including without limitation the cost of appurtenant items of work, labor, materials, fees, bond costs, supplies, utilities, royalties, tools, forms and equipment, and all other costs (including without limitation sales and use tax, insurance, licenses, permits, profit, and other overhead) not listed separately, not shown on the Plans and Specifications, or not specified but necessary to complete the Work in accordance with the Contract Documents).
- 1.1.1. **Weather Day:** Any day on which Work is scheduled in the Construction Schedule but cannot be performed within contract weather or temperature limitations or due to weather related soil conditions, and where work on critical activities cannot be performed for more than fifty percent (50%) of the work day, including any day immediately following a Weather Day on which subsequent day Work was scheduled in the Construction Schedule but cannot be performed on scheduled critical path activities due to weather related site or soil conditions for more than fifty percent (50%) of the day (drying days).
- 1.1.2. **Work:** The construction and services required by the Contract Documents, whether completed or partially completed, including all other labor, materials, equipment, supplies, management, administration, supervision, manufactured components, and

services provided or to be provided by the Contractor to fulfill the Contractor's obligations under the Contract. The Work may be the whole or a part of the Project.

1.2. Words of Importance.

When the Contract Documents use the phrases or words "as directed," "as required," "approved," "acceptable," "satisfactory," or other phrases or words of like meaning without further indication, the intended direction, requirement, approval, or satisfaction shall be that of the Project Manager.

1.3. References.

Words describing materials or Work having a well-known technical or trade meaning in an industry, unless otherwise specifically defined, shall be construed in according to well-known meanings as recognized by engineers, architects, and the trades. All references to standard specifications, methods of testing materials, codes, practices, and requirements refer to the edition of each in effect on the date of the Request for Bids unless a specific edition or revision is referenced.

1.4. Computation of Time.

Any period of time referred to in the Contract Documents will be computed to exclude the first and include the last day of the period. If the last day of the period falls on a Saturday, Sunday, or legal holiday for the City, such day will be omitted from the computation.

1.5. Abbreviations.

When the following abbreviations appear in the documents, they are defined as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ACOE or COE	U.S. Army Corps of Engineers
AGC	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APHA	American Public Health Association
APWA	American Public Works Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWSC	American Welding Society Code
AWWA	American Water Works Association
CDOT	Colorado Department of Transportation
CPM	Critical Path Method
DHS	U.S. Department of Homeland Security
EPA	U.S. Environmental Protection Agency
GESC	Grading, Erosion and Sediment Control
IEEE	Institute of Electrical and Electronic Engineers

MUTCD	Manual on Uniform Traffic Control Devices
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety & Health Administration
RCRA	Resource Conservation and Recovery Act
SAME	Society of American Military Engineers
SACWSD	South Adams County Water & Sanitation District
SAVE	Systematic Alien Verification or Entitlement program
WW-P	Federal Specifications Prefix

ARTICLE 2 PRELIMINARY MATTERS

2.1. Notice to Proceed.

The City will give the Contractor written Notice to Proceed with the Work after execution of the Contract by the City. The Contractor shall begin the Work by the date stated in the Notice to Proceed and diligently pursue the Work regularly and without interruption (unless otherwise directed in writing by the Project Manager) with the force necessary to complete the Work and achieve Final Acceptance within the Contract Time. If any milestones are described in the Contract Documents or the approved Construction Schedule, the Work described by each milestone shall be accomplished on or before that milestone in accordance with the Contract Documents.

2.2. Construction Schedule.

- 2.2.1. Within the time specified in the Request for Bids, the Contractor shall submit to the City a proposed Construction Schedule using Primavera, MS Project or other comparable Critical Path Method (CPM) scheduling software.
- 2.2.2. The Construction Schedule must include all Work activities to be performed under the Contract including any work to be performed by Subcontractors and must account for all Reasonably Predictable Weather Days. All activities should be logically tied with a critical path clearly identified. The schedule must have sufficient detail to adequately plan and manage the Work. Contractual and key milestones are to be identified.
- 2.2.3. The Construction Schedule must include a brief narrative including:
 - a) A Critical Path description;
 - b) Identification of non-work days such as weekends or holidays;
 - c) A table showing calculated Reasonably Predictable Weather Days (including drying days for each month); and
 - d) List of assumptions used while developing the Construction Schedule.
- 2.2.4. It will be presumed that the Contractor, at the time of bidding, took into account the number of days which might be unavailable for Work as a result of Reasonably Predictable Weather Days during the Contract Time.
- 2.2.5. The Contractor shall calculate Reasonably Predictable Weather Days by using the last ten (10) years of historical weather data from the nearest NOAA weather data collection station, or other approved weather station, to compute the average number

of Weather Days for each month of the Construction Schedule.

- 2.2.6. On a monthly basis with each pay application and as requested by the Project Manager, the Contractor shall update the Construction Schedule and provide a summary report of progress on the various parts of the Work, including the status, rate of progress, estimated completion date, and cause of delay, if any. This report shall not constitute a request or approval for any change in the Contract Time.
- 2.2.7. Work shall normally not be done on Saturdays, Sundays, City observed holidays, or outside of the daytime working hours (7:00 a.m. to 5:00 p.m.), except for such work as may be necessary for proper care, maintenance, and protection of Work already done, or in cases when the Work would be endangered or when hazard to life or property would result.
- 2.2.8. If the Contractor believes it may be necessary to work on Saturdays, Sundays, holidays, or at night, the Contractor shall make prior arrangements with the Project Manager and receive written approval at least twenty-four (24) hours before such work period so that proper inspection and engineering services can be provided. Such approval may be revoked by the Project Manager if the Contractor fails to maintain adequate equipment and lighting at night for the proper prosecution, control and inspection of the Work. If Work is done outside of approved working hours, and the Project Manager has not assigned Inspectors to the Work, the Work performed during those periods of time may be declared defective solely on the grounds that it was not properly inspected.

2.3. Pre-Construction Meeting.

Before Work is commenced and materials are ordered, the Contractor shall meet and consult with the Project Manager relative to the materials, equipment, schedule, site, and other arrangements for the commencement of the Work.

2.4. Contractor's Understanding of Work.

The Contractor agrees that, by careful examination, it is satisfied as to the nature and location of the Work, the conformation of the ground, the character, quality, and quantity of the materials to be encountered, the character of equipment and facilities needed before beginning and for the Work, the general and local conditions, and all other matters, which can in any way affect the Work under the Contract. No oral agreement with any officer, agent, or employee of the City either before or after the execution of the Contract shall affect or change any of the terms or obligations contained in the Contract.

2.5. Contractor's Representation.

The Contractor represents and warrants that it has the knowledge, ability, experience, and expertise to perform the Work competently in accordance with the Contract Documents. The Contractor represents and warrants the capacity of the Contractor's construction plant, personnel, and its ability to complete the Work by the Completion Date.

2.6. Other Work.

The City reserves the right to award other contracts in connection with the Project or other activities. The Contractor must be prepared to accept the presence, on or adjacent to the construction site, of work forces of other contractors, subcontractors, tenants, government

agencies and municipal, public service or utility systems. The Contractor shall cooperate with and afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall coordinate its Work with theirs. If it becomes impossible to proceed with the Work in a manner that permits all activities to progress at a reasonable pace, the Project Manager will select the course of action that appears to best serve the City.

2.7. Notices.

Except for routine communications, written notices required under this Contract and all other correspondence between the Parties will be deemed received when hand-delivered or three (3) days after being sent by certified mail, return receipt requested (unless the Parties consent to electronic delivery). The address in the Bid will be the Contractor's address for the delivery of notices, unless modified by the Contractor by written notice at least three (3) business days prior to the change. Notices to the City shall be delivered to the Project Manager except as provided in the Contract Documents.

2.8. Contractor's Signs.

No signs with Contractor's name, logo, telephone number, address or, (etc.), shall be placed on any pole, road, structure or other surface, unless approved in writing, and in advance of such placement, by the City.

2.9. Publicity and Advertising.

2.9.1. Neither the Contractor nor its Subcontractors or Suppliers shall include any reference to the Contract or to Work performed hereunder in any advertising or public relations materials without first obtaining the written approval of the Project Manager. All information shall be factual, and shall in no way imply that the City endorses the Contractor or its services or product.

2.9.2. The City shall have the right to photograph, videotape, film or in any other manner record the progress of the Work at any time and to use such materials for any purpose.

ARTICLE 3 DRAWINGS AND SPECIFICATIONS

3.1. Intent of Drawings and Specifications.

3.1.1. In the Drawings and Specifications, the City intends that the Contractor furnish all superintendence, labor, materials, tools, equipment, supplies, machinery and transportation necessary for the proper execution of the Work unless specifically noted otherwise. The Contractor shall do all the Work shown on the Drawings and described in the Specifications and all incidental Work reasonably necessary to complete the Project in a substantial and acceptable manner, and to complete fully the Work, ready for use, by the City. The Contractor shall complete all Work according to the Specifications and Drawings.

3.1.2. The Contract Documents are intended to be complementary, and Work called for on any Drawing and not mentioned in the Specifications, or Work described in the Specifications and not shown on any Drawing, is included under the Contract as if set forth in both the Specifications and Drawings.

3.1.3. Material and workmanship specified by the number, symbol, or title of a referenced

standard shall comply with the latest edition or revision thereof and any amendments or supplements thereto in effect on the date the bid is received except where a particular issue or edition of a publication is indicated. In case of a conflict between the Drawings, Specifications and the referenced standard, the more stringent shall govern, as determined by the Project Manager.

- 3.1.4. If labor, materials or equipment, although not described by the Drawings or Specifications, is required to successfully complete the Work and can reasonably be inferred by competent contractors by virtue of common knowledge or customary practice in the construction industry from the Contract Documents as being necessary to produce the intended result, the Contractor shall perform that work or provide the materials or equipment as if they were specified.
- 3.1.5. Contractor shall carefully study the Contract Documents and, if Contractor identifies any discrepancies found between the Drawings and Specifications and site conditions and any adjacent work on which the Work is dependent and any errors or omissions in the Drawings or Specifications, shall promptly notify the Project Manager of such discrepancies, errors, or omissions in writing, and any necessary changes shall be accomplished by issuance of an appropriate Change Order or Field Order. Any Work done by the Contractor after discovery of such discrepancies, errors or omissions prior to the issuance of a Change Order or Field Order is done at the Contractor's risk. In all cases, the Project Manager shall decide the intent of the Drawings and Specifications.
- 3.1.6. If the Contractor or any of its Subcontractors or Suppliers, knows or reasonably should know by virtue of common knowledge or customary practice in the construction industry that any of the Contract Documents are at variance with applicable laws, statutes, ordinances, building codes, or rules or regulations, in any respect, the Contractor shall promptly notify the Project Manager in writing, and any necessary changes shall be accomplished by issuance of an appropriate Change Order or Field Order. The Contractor shall assume full responsibility for, and shall bear all costs attributable to work performed by the Contractor or any Subcontractor prior to the issuance of a Change Order or Field Order when any of them know or reasonably should know that it is contrary to such laws, statutes, ordinances, building codes, rules or regulations.
- 3.1.7. The Contractor, before commencing work, shall verify all governing dimensions, and shall examine, to the extent reasonable, all adjoining work on which its Work is in any way dependent. No disclaimer of responsibility for defective or non-conforming adjoining work will be considered unless written notice of the same has been filed by the Contractor and agreed to in writing by the Project Manager before the Contractor begins any part of the affected Work.
- 3.1.8. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, approved Drawings, Specifications, instructions, Shop Drawings, product data, or samples for such portion of the Work.

3.2. Copies of Drawings and Specifications Furnished.

The Project Manager will furnish to the Contractor copies of Drawings and Specifications of the Work at reproduction costs (including labor) or electronic copies of Drawings and Specifications in electronic form at no charge.

3.3. Utilities.

- 3.3.1. Delays relating to relocation of utilities should be anticipated for Work on or involving City rights-of-way.
- 3.3.2. It is the Contractor's responsibility to verify all locations of existing structures and utilities shown on the Drawings and to ascertain whether any other structures and utilities exist. The Drawings show available information on the location of existing underground, surface and overhead structures and utilities. However, the City does not guarantee the results of the investigations are accurate or complete.

3.4. Requests for Clarifications and Information.

- 3.4.1. The Contractor shall submit any requests for information or clarification of Drawings and Specifications to the Project Manager or to the person who has been designated by the Project Manager to receive such requests. When the City responds to such requests for information or clarification, it will issue a response which can consist of a written explanation with or without drawings or other information in the City's sole discretion. Such requests and responses to such requests shall neither authorize nor constitute changes in the Contract Time or Contract Price. If the Contractor believes that the response to any request for information or clarification requires a change in Contract Time or Contract Price, it shall submit a Contractor Change Request in accordance with the Contract Documents.
- 3.4.2. The Contractor shall review and attempt to answer requests for information or clarification from its Subcontractors and Suppliers. Such requests shall be encompassed within the Contractor's request for information or clarification by the Contractor to the Project Manager if the Contractor is unable to answer such requests.

3.5. Dimensions.

Figured dimensions shall govern over scaled dimensions.

3.6. Shop Drawings.

- 3.6.1. The Contractor shall provide Shop Drawings, settings, schedules, and such other Drawings as may be necessary for the prosecution of the Work in the shop and in the field as required by the Drawings, Specifications or Project Manager's instructions.
- 3.6.2. The Contractor shall submit for approval three (3) reproducible copies of all Shop Drawings and descriptive data as applicable showing all features not fully detailed on the Specifications but essential for a completely coordinated installation. An additional copy shall be provided for each railroad company affected by the Work. The Contractor will correct errors in Shop Drawings as directed by the City.
- 3.6.3. The City's approval of Shop Drawings indicates only that the type and kind of equipment and general method of construction or detailing are satisfactory and in general compliance with the Contract Documents and design concept of the Project. The Contractor has the responsibility for incorporating into the Work satisfactory materials and equipment meeting the requirements of the Contract Documents, the proper dimensions, and the detailing of connections.
- 3.6.4. The Contractor may not construe such approval as a complete check and approval

does not indicate the waiver of any Contract requirement. Changes in the Work are authorized only by separate written Change Order.

3.7. Record Documents.

- 3.7.1. The Contractor shall keep one complete set of all Drawings and Specifications at the work site and available to the City and its representatives at all times.
- 3.7.2. The Contractor shall keep one record copy of all Amendments, Change Orders, Drawings, Field Orders, Shop Drawings and Specifications in good order.
- 3.7.3. The Contractor shall record any changes made during construction and any discrepancies between the Contract Documents and Work actually performed on the record copies (however minor or seemingly insignificant). The Contractor shall make a set of "Record Drawings" by marking this set of prints with all changes from the original Drawings as bid, including all Change Orders, alignment changes, depth changes of underground pipes and utilities, utility locations, and all other items that are not the same as originally drawn. The Contractor shall keep the Record Drawings up to date as the Project progresses. The Project Manager may require, as a condition of the approval of any progress payment, periodic inspection of the Record Drawings. The Contractor will deliver the Record Drawings to the Project Manager upon completion of the Project before Final Payment.
- 3.7.4. All Contract Documents are the property of the City and shall not be used by the Contractor for any purpose other than the Work to be performed under the Contract. At Final Acceptance, all Shop Drawings and Record Drawings, including all material in electronic format shall become the property of the City. The Contractor will be permitted to maintain a copy of the Drawings, Specifications and Shop Drawings as necessary to maintain a Contract record file.
- 3.7.5. The Contractor shall prepare and keep current a schedule of submittals that shall note all required submittals, submittal dates, required approval dates, and all required delivery dates.

3.8. Site Inspection & Differing Site Conditions.

- 3.8.1. Drawings and specifications defining the Work were prepared on the basis of interpretation by design professionals of information derived from investigations of the Work site. Such information and data are subject to sampling errors, and the interpretation of the information and data depends to a degree on the judgment of the design professional. Information about the degree of difficulty of the Work to be done cannot totally be derived from either the Drawings or Specifications or from the Project Manager. The Contractor shall not be entitled to an adjustment to the Contract Time or Contract Price for any condition that was or would have been evident at the time of a pre-bid site inspection. By executing the Contract, the Contractor represents that it has visited the site if and to the extent it believed necessary, familiarized itself with the location and conditions under which the Work is to be performed, and correlated its observations with the requirements of the Contract Documents.
- 3.8.2. The Contractor shall promptly, before such conditions are further disturbed, notify the Project Manager in writing of:

e) Subsurface or latent physical conditions at the Work site differing materially from

those indicated in the Contract; or

f) Unknown physical conditions at the Work site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

3.8.3. Upon receipt of written notification from the Contractor of alleged differing site conditions, the City shall promptly investigate the conditions. If the City finds that the conditions materially differ and could not have been discovered, or reasonably inferred, from the Contract Documents or a thorough inspection of the Work site by the Contractor, and such conditions cause an increase or decrease in the Contractor's cost of or the time required for performance of any related part of the Work under the Contract, an adjustment to the Contract Time or Contract Price, or both, may be made through a Change Order.

3.8.4. If the Contractor has not fully complied with the notice and submittal requirements of this section or any part of the General Conditions pertaining to Change Orders, with particular attention to not disturbing the site prior to allowing the City to investigate the conditions, the Contractor shall be deemed to have waived its right to assert a claim for differing site conditions.

3.8.5. No claim will be allowed under this section if Final Payment has been made.

3.9. Geotechnical and Other Design Professional Reports, Investigations & Tests.

3.9.1. The Contractor acknowledges that certain soils reports, borings, and other geotechnical data, more particularly described or referenced in the Specifications of the Contract, have been made available for inspection and review. The borings were made for the use of the City in the design of the Project and are not intended to be interpreted for use in temporary construction facilities designed by the Contractor.

3.9.2. The City in no way warrants the accuracy or reliability of said borings and other geotechnical data or of the data, information or interpretations contained in said soils reports, and is not responsible for any deduction, interpretation, or conclusion drawn therefrom by the Contractor. Said soil reports may contain interpretations by design professionals of borings and geotechnical data obtained at the Work site. Such borings and geotechnical data are subject to sampling errors, and any interpretations or conclusions based on such borings and data depend to a degree on the judgment of the design professionals.

3.9.3. The Contractor agrees that it will make no claims against the City if, in performing the Work, it finds that the actual conditions encountered do not conform to those indicated by said soil reports, borings and other geotechnical data, or those reasonably inferred therefrom or reasonably discoverable by a thorough inspection of the site by the Contractor.

ARTICLE 4 RIGHT-OF-WAY & ACCESS

4.1. Acquisition of Right-of-Way.

4.1.1. Before issuance of Notice to Proceed, the City shall obtain all land and right-of-way necessary for carrying out and completion of the Work to be performed pursuant to the Contract, unless otherwise mutually agreed.

4.1.2. The City shall provide to the Contractor information that delineates and describes the lands owned and rights-of-way acquired, when necessary. The Contractor shall confine its operations within the areas designated by the Project Manager.

4.2. Access to Right-of-Way.

4.2.1. The City will make best efforts to provide right of access to all places necessary for the performance of the Work in a timely manner. The City will not be liable to Contractor for any delay in providing access for reasons outside the City's control.

4.2.2. Nothing contained in the Contract shall give the Contractor exclusive occupancy of the area provided by the City. The City, other contractors of the City and utility companies may enter upon or occupy portions of the land furnished by the City for any purpose, but without unreasonably interfering with the completion of the Project. Joint occupancy or use of the territory shall not be the basis of any claim for delay or damages.

4.3. State Highway Right-of-Way.

If any part of the Project requires Work within the right-of-way of a roadway under the jurisdiction of the Colorado Department of Transportation (CDOT) the Contractor shall obtain the necessary permits from CDOT to perform such Work. The Contractor shall conform to all the requirements and restrictions indicated on the permit. The Contractor shall restore the area to its original condition, including reseeding if necessary, at the completion of the Project. The Contractor's equipment shall not be stored on any traveled highway.

ARTICLE 5 CONTRACTOR'S GENERAL RESPONSIBILITIES

5.1. Contractor Performance.

5.1.1. The Contractor will perform the Work or cause the Work to be performed in a manner that is in compliance with the requirements of the Contract Documents. The Contractor shall perform the Work exactly as specified by the Contract Documents.

5.1.2. Unless otherwise provided in the Contract Documents, for the Unit Prices, the Contractor shall provide and pay for all labor, materials, equipment, tools, supplies, construction equipment and machinery, water, heat, electricity, energy, utilities, transportation, any temporary construction easements not provided by the City, apparatus, permits, superintendence, maintenance, dismantling, removal, and other facilities and services, necessary for the proper execution and completion of the Work, whether temporary or permanent, and whether or not incorporated or to be incorporated into the Work.

5.1.3. The Contractor shall supervise and direct the Work using the Contractor's best efforts, skill and attention.

5.1.4. The Contractor shall also supervise, direct and be responsible for all work performed by its Subcontractors, their agents and employees and other persons performing any of the Work under a contract with the Contractor, Subcontractors of any tier, or Suppliers of any tier.

5.1.5. The Contractor shall be solely responsible for all construction means, methods, safety, techniques, sequences and procedures unless otherwise specified in the Contract

Documents.

- 5.1.6. When the work includes adjusting valve boxes, meter pits, manholes, pavement markings and/or striping, etc., the Contractor shall complete this work within ten (10) days of placing the final lift of asphalt.

5.2. **Contractor's Superintendent.**

- 5.2.1. The Contractor shall designate a Superintendent to be its representative and have immediate charge of the Project. The Superintendent or his or her representative shall have the Contractor's authority to act in its absence. The same person shall continue in the capacity of Superintendent until the Work has been completed unless the City requests that the Superintendent be replaced or the Superintendent ceases to be employed by the Contractor or becomes sick or disabled.
- 5.2.2. All directions and notice given to the Superintendent or his or her representative shall be considered given to the Contractor.
- 5.2.3. The Contractor shall keep the Project Manager informed, at all times, of the progress of the work and schedule of construction. The Superintendent or his or her representative shall have a radio, cell phone, or pager to be available to the Project Manager or any inspector as needed. The Project Manager may suspend operations at the Work site if the City cannot communicate with the Superintendent.
- 5.2.4. Any person employed on the Project who fails, refuses, or neglects to obey the Superintendent or his or her representative shall, upon the order of the Project Manager, be at once removed from the Project and not again employed on any part of the Project.

5.3. **Subcontractors.**

- 5.3.1. The Contractor may use the services of specialty Subcontractors on those parts of the Work which, under normal contracting practices, are performed by specialty Subcontractors.
- 5.3.2. The Contractor shall not sublet or subcontract any portion of the Work to be done under the Contract to any Subcontractor or Supplier not identified in the Bid until approval of such action has been obtained from the City. The City may disapprove of a Subcontractor for any reason deemed appropriate by the Project Manager, including without limitation:
 - a) Default on a contract within the last five (5) years;
 - b) Default on a contract that required that a surety complete the contract under payment or performance bonds issued by the surety;
 - c) Debarment within the last five (5) years by a public entity or any organization that has formal debarment proceedings;
 - d) Significant or repeated violations of Federal Safety Regulations (OSHA);
 - e) Failure to have the specific qualifications listed in the Contract Documents for the work that the Subcontractor will perform;
 - f) Failure to have the required City or Colorado licenses to perform the work

described in the subcontract;

- g) Failure to pay workers the proper wage and benefits or to pay suppliers or subcontractors with reasonable promptness within the last five (5) years;
- h) Conviction, plea of nolo contendere, entry into a formal agreement admitting guilt or entry of a plea of guilty or otherwise admitting culpability to criminal offenses of bribery, kickbacks, collusive bidding, bid-rigging, anti-trust, fraud, undue influence, theft, racketeering, extortion or any offense of a similar nature in connection with Subcontractor's business, on the part of Subcontractor's principal owners, officers, or employees, within the last five (5) years;
- i) Failure to pay taxes or fees to the City;
- j) Evidence that the Subcontractor was selected by the Contractor through the process of bid shopping, dishonesty or buyout.

Rejection or acceptance of any Subcontractor shall not create in that Subcontractor a right to any subcontract or the right to perform any portion of the Work, nor shall acceptance or rejection relieve the Contractor its responsibilities for the work of any Subcontractor.

- 5.3.3. The Contractor is fully responsible to the City for the acts and omissions of its Subcontractors, and of persons either directly or indirectly employed by them.
- 5.3.4. The action or omission of any Subcontractor in violation of this Contract or any subcontract will not relieve the Contractor from any obligation under this Contract or at law.
- 5.3.5. Nothing contained in the Contract or any exercise of rights under this Contract creates any contractual relationship or privity of contract tween any Subcontractor and the City.
- 5.3.6. The Contractor shall put appropriate provisions (including the indemnity and insurance provisions) in all Subcontracts relative to the Work to bind Subcontractors to the terms of the Contract insofar as applicable to the work of Subcontractors (even if not specifically required here), and to give the Contractor the same power to terminate any Subcontractor that the City may exercise over the Contractor.
- 5.3.7. The Contractor shall specifically stipulate in all Subcontractor or Supplier contracts and purchase order forms for all materials and systems that the guarantee period begins with the date of Substantial Completion. The Contractor shall, during the course of the Work, specifically instruct Subcontractors and Suppliers that all written guarantees, that are due to be submitted to the City, shall indicate the initiation of the guarantee period as being the date of Substantial Completion.
- 5.3.8. The Contractor shall make available to each proposed Subcontractor, before the execution of the subcontract, complete and accurate copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Subcontractors.

5.4. Workforce.

- 5.4.1. The Contractor shall assign an adequate number of qualified, competent workers to each task to complete the Work on schedule and in accordance with the Contract Documents.
- 5.4.2. If the City believes that the Work is not proceeding satisfactorily or may not be satisfactorily completed by the Completion Date, the Project Manager may, by letter to the Contractor, require the Contractor to submit a corrective action plan identifying steps to be taken, at no additional cost to the City, to raise the rate of progress to an acceptable level.
- 5.4.3. Competent personnel with experience and skills adequate for the assigned tasks are an absolute necessity for job safety and for the performance of quality work. The Contractor and any Subcontractor shall employ only foremen and workers skilled in the Work requiring special qualifications. The Contractor shall reassign or remove from the Project all personnel who are requested to be reassigned or removed by the Project Manager or who are incompetent, uncooperative, refuse to comply with safety requirements, or are otherwise unfit to perform the assigned task. No increase in Contract Time or Contract Price is authorized as a result of the City's exercise of this section.

5.5. Work Performed Under Adverse Weather Conditions.

- 5.5.1. Adverse weather conditions are those that can, depending on the Work to be performed, cause defective Work. High or low temperatures, excessive moisture, or unusual drying conditions are examples.
- 5.5.2. Construction methods and practices that have been or may be developed for Work performed under such circumstances may only be used after the Project Manager has approved the concept of such method or practice.
- 5.5.3. If the Contractor does attempt Work during periods of adverse weather conditions without the Project Manager's approval, that Work shall be at the Contractor's sole risk.

5.6. Materials and Equipment Furnished by the Contractor.

- 5.6.1. Unless otherwise provided for in the Specifications, all workmanship, equipment, materials, and articles incorporated in the Project are to be new, suitable for the purpose used, of good quality, free from faults and defects and in conformance with the Contract Documents.
- 5.6.2. The Contractor further warrants that it has full title to all parts, materials, components, equipment, and other items conveyed to the City under the terms of the Contract, that its transfer of such title to the City is rightful and that all such parts, materials, components, equipment, and other items shall be transferred free and clear from all security interests, liens, claims, or encumbrances whatsoever. Materials, supplies, and equipment to be incorporated into the Project shall not be purchased by the Contractor or any Subcontractor subject to chattel mortgage or under a conditional sales contract or other agreement by which an interest is retained by the seller. The Contractor agrees to warrant and defend such title against all persons claiming the whole or any part thereof, at no cost to the City.

- 5.6.3. The Contractor shall furnish the City, for the Project Manager's approval, the name of the manufacturer of machinery and other equipment for materials the Contractor contemplates incorporating in the Project. The Contractor shall also furnish information on capacities, efficiencies, sizes, etc., and other information as may be required by the Project Manager. All items shall be labeled to indicate the Contract and Project name, Contractor, source of supply, and manufacturer and shall be submitted in sufficient time to permit proper consideration by the Project Manager without impacting the Construction Schedule.
- 5.6.4. The Contractor shall have available for use when needed all necessary construction machinery and equipment. Such machinery and equipment shall comply with all applicable federal, state and local safety requirements and be in good working condition, adequate for the task, and in the numbers needed to maintain a rate of progress sufficient to complete the Work within the Contract Time and milestones. Whenever an operation is undertaken which must be accomplished without any slowdown or stoppage, or to avoid an inferior product, the Contractor shall provide standby equipment capability so that an equipment breakdown does not disrupt that activity.
- 5.6.5. The Contractor shall give the Project Manager three (3) copies of all shop manuals, operating manuals, parts lists, classifications, catalog cuts, specifications, warranties and guarantees for all equipment and machinery installed.
- 5.6.6. Consideration of a product as an "equal" by the Project Manager may require that the manufacturer of such product furnish guarantees that extend beyond the usual product warranty time. The refusal of a manufacturer to provide such guarantees is sufficient reason for rejecting the product.
- 5.6.7. The Contractor shall not incorporate any materials into the Project or cover any part of the Work until it has been inspected and approved according to the Contract Documents. Machinery, equipment, materials, and articles installed or used without the Project Manager's approval are at the risk of subsequent rejection.

5.7. Substitution of Materials & Equipment.

- 5.7.1. After the award of the Contract, the Contractor may ask for substitution of specified material or equipment with equal or equivalent items only under the following circumstances: (i) The Contractor provides evidence to the Project Manager that, in the Project Manager's sole opinion, establishes that an item of specified material is not available; (ii) the Contractor provides evidence to the Project Manager that, in the Project Manager's sole opinion, establishes that the specified item will have an unreasonable delivery time due to no fault of the Contractor; or (iii) acceptance of such substitution would result in a significant saving to the City without materially impairing the quality or performance of the Work. If any of these circumstances exist, the Contractor shall request approval for a substitution at least thirty (30) days before the material or equipment must be ordered.
- 5.7.2. All requests for substitutions shall be made in writing as part of a submittal. The request shall describe all features of the requested substitution including any tie-in with other elements of the Work, including utilities and controls along with the size and capacity of substitute materials or equipment. The request must be submitted on a form provided by or otherwise acceptable to the Project Manager, and shall list all

differences from the product described in the Specifications, include the price of the specified item and the requested substitution, and describe any advantages or disadvantages of the proposed substitution. The Contractor shall be responsible for any effect upon related Work in the Project of any substitution and shall pay any additional cost resulting from or relating to any substitution.

5.7.3. If the “equal or equivalent” material or equipment costs less than that specified, the Contractor shall so state in its request for substitution and, if the City accepts the proposed substitution, it may issue a Change Order to reduce the Contract Price by the amount of the direct cost savings without markup to the Contractor.

5.7.4. If the equal or equivalent material or equipment is accepted for unavailability or unreasonable delivery time due to no fault of the Contractor, the City may, if appropriate, issue a Change Order to increase the Contract Price by the resulting actual, direct cost increase, if any, to the Contractor, without markup.

5.8. Defective Work and Materials.

5.8.1. Material and workmanship not conforming to the requirements of the Contract are deemed defective. The Contractor shall bear all costs of investigating and correcting such defective Work and materials, which includes design efforts necessary to correct such Work.

5.8.2. Whether or not the Work is defective will be determined by comparing it to the Contract Drawings, Specifications, accepted Shop Drawings and manufacturer’s literature and further measuring it against the standard of quality implied by the Contractor’s warranty. Also, should the appearance and performance of any element of the Work fail to conform to standards of the trade for such Work, that Work may be declared defective.

5.8.3. Defects discovered by any inspection process or testing, or otherwise made apparent during the Work, shall be repaired, removed, or replaced by the Contractor, at no cost to the City, as identified. The City shall have the right to charge the Contractor for its costs of re-inspecting the Work after the defective Work is corrected and any costs of verifying or determining the existence of latent defects.

5.8.4. If the Contractor fails to replace rejected materials or Work within ten (10) days after receipt of written notice, the City may replace or correct them and charge the cost to the Contractor and may terminate the right of the Contractor to proceed.

5.8.5. Failure to detect previously installed defective materials or workmanship shall not impair the City’s right to receive a completed Work, which is free of defects and meets all of the requirements of the Contract Documents. Nothing in this section shall limit the City’s right to seek recovery for latent defects that are not observable until after any warranty or guaranty periods have run.

5.9. Cutting and Patching.

5.9.1. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to complete the Work, to make its several parts fit together properly or to tie the Work into other work that is shown in the Contract Documents.

5.9.2. The Contractor shall organize and plan the Work to reduce to a minimum the need for

cutting or otherwise modifying or removing load-bearing structural elements to accommodate the installation of other elements of the Work. If two or more contractors are doing work in the same place, the Contractor shall be responsible for the coordination effort needed to avoid or to reduce the amount of cutting, modifying or removing of structural elements to accomplish such work. However, if modification or removal of structural elements is required because the Work could not be organized and planned to avoid that need, the Contractor shall inform the Project Manager of the need so that the consequences of such modification or removal of structural elements can be assessed. No structural element shall be cut, drilled, bored or otherwise modified unless cutting, drilling, boring or other modification is indicated in the Contract Documents.

- 5.9.3. If the Contractor needs to modify a structural element from its original design, the Contractor must submit to the Project Manager a request to make the modification. The request must provide complete details including all necessary calculations performed by a professional engineer licensed in the State of Colorado to show that the structural elements can still function as originally designed. The request must be accepted by the Project Manager before any modification is made.
- 5.9.4. The Contractor shall be responsible for all repair, replacement, and patching that is necessary to restore the Work, other property, or work of others damaged by the Contractor.

5.10. **Samples and Testing.**

- 5.10.1. All materials and equipment used in the Project will be subject to sampling and testing by an independent testing company acceptable to the City according to generally accepted standards and as required in the Contract Documents. In the absence of direct references, the sampling and testing of materials will be done according to current specifications of the ASTM or the AWWA.
- 5.10.2. The Contractor shall furnish all samples without charge. The Contractor will cooperate with the Project Manager in collecting, handling, storing, and forwarding required samples including the furnishing of manpower and equipment when necessary.
- 5.10.3. The Contractor will pay the cost of the initial test except when the Contract states otherwise. The Contractor will pay the costs for repeated tests due to failure of the initial test. The costs of any testing and retesting may be deducted from any payment due to the Contractor under the Contract.
- 5.10.4. The Contractor will provide the Project Manager at least twenty-four (24) hours prior notice for any inspection involving testing or sampling.
- 5.10.5. The Contractor shall be responsible for testing of concrete and soils and, unless otherwise specified, the Contractor shall perform testing of all other materials and equipment. The Contractor shall provide the Project Manager with satisfactory proof of compliance with the requirements of the Contract Documents of any materials or equipment tested. Satisfactory proof of compliance shall be submitted in one or more of the following ways:
 - a) Manufacturer's Certificate of Compliance. For standard labeled stock products of standard manufacture that have a record of satisfactory performance in similar work over a period of not less than two (2) years, the Project Manager may accept

a notarized statement from the manufacturer certifying that the product conforms to the applicable specifications.

- b) Mill Certificates. For materials where such practice is the usual standard, the Project Manager may accept the manufacturer's certified mill and laboratory certificate.
- c) Testing Laboratory Certificates. The Project Manager may accept a certificate from an independent commercial testing laboratory satisfactory certifying that the product has been tested within a period acceptable to the Project Manager and that it conforms to the requirements of the Plans and Specifications.
- d) Report of Actual Laboratory Test. The Project Manager may require that Contractor make actual tests of any product and submit a report of the specified test. Such test shall be made by a commercial testing laboratory satisfactory to the Project Manager at the Contractor's sole expense.

5.11. Substituted Performance.

- 5.11.1. If the Contractor's failure of exact performance does not appear to the City to be deliberate or willful and if the City concludes that less than exact performance in some minor part of the Work will not result in a decrease in quality in the entire Work, the City may, at its sole option, accept substituted performance.
- 5.11.2. Should the City accept substituted performance, the cost of the Work shall be reduced by the sum of money that the City determines to be a reasonable consideration for less than exact performance and the City may, at its discretion, require separate warranties for any substituted performance.

5.12. Project Signs.

- 5.12.1. One or more project signs may be posted at each Work site. The City will prepare any signs at its expense. When the City notifies the Contractor that the signs are ready, the Contractor shall deliver the signs to the Work site and install them in locations designated by the Project Manager. As the Work progresses, the Project Manager may direct the Contractor to relocate the signs. The Project Manager will direct the Contractor as to final removal of the signs, either upon completion of the Work or at such other time as the Project Manager may determine.
- 5.12.2. All costs of transporting, installing, relocating and removing such signs shall be borne by the Contractor. The Contractor shall pay the costs of repairing any damage to the signs which occurs after the Contractor takes possession of the signs.

5.13. Surveys.

- 5.13.1. The City shall develop and arrange for all engineering surveys necessary, in the City's judgment, to establish reference points for the construction of the Work. The Contractor assumes full responsibility for construction according to the established lines and grades. If the Contractor proceeds with the Work without having lines and grades set, the Contractor will not be relieved of strict compliance with the Contract Documents.
- 5.13.2. The Contractor shall carefully protect all monuments and property markers from disturbance or damage. The Contractor, at its expense, will replace any monuments or benchmarks destroyed by the Contractor using a professional land surveyor licensed in the State of Colorado.

- 5.13.3. Unless otherwise stated in the Specifications or the Special Conditions, the City will provide all reference points shown on the Contract Drawings by coordinates and/or elevation. The Contractor must accurately transfer the survey control information to the points of application to ensure that all elements of the Work are correctly located.
- 5.13.4. Requests by the Contractor to relocate survey reference points must be made ninety-six (96) hours prior to the time when the point will be disturbed in order to permit the City to accomplish such surveys on normal working days.
- 5.13.5. Any Work that the Contractor begins before confirming the reference points provided may be rejected.
- 5.13.6. Should the original reference points that the City provided be obliterated or dislodged by operations that the Contractor controls, the City will replace them and charge the Contractor for the resurvey. The cost of these resurveys will be determined by multiplying the hourly equivalent of the salaries and fringe benefits paid to the survey personnel actually involved in the resurvey by the hours expended in doing that resurvey, plus material and equipment costs.

5.14. Lines and Grades.

- 5.14.1. The Contractor shall survey and stake and shall be responsible for laying out the work.
- 5.14.2. The Contractor shall preserve all stakes, bench marks, and any other survey points and shall pay for the replacement, in accordance with state law, of any stakes, benchmarks, or other survey points destroyed by the Contractor or any Subcontractor.

5.15. Value Engineering.

Value engineering includes changes in materials or methods used that will reduce the amount of the Contract and will preserve the integrity of the Work without reducing quantities completed. Proposed changes in materials or methods used must be approved by the Project Manager and any agency having jurisdiction over the affected work before such work is attempted. The Contractor shall be paid fifty percent (50%) of all identifiable cost savings resulting from said value engineering approved and accepted. A Change Order must be issued to effect such a value engineering task.

5.16. Patents and Copyrights.

- 5.16.1. The Contractor's bid price shall be considered to include a sufficient sum to cover all fees, royalties and claims for any material, artist rights, process, patent rights, machine, appliance, copyright, trademark, or any arrangement that may be used upon or in any manner connected with or appurtenant to the Work.
- 5.16.2. The Contractor shall provide a suitable legal agreement giving the Contractor the right to use any design, device, material, or process covered by letters patent or copyright, in the construction of the Project when the use has not been specified or required by the Drawings and Specifications. The Contractor shall file a copy of this agreement with the City, if requested. The Contractor and the Surety shall indemnify, defend and save harmless the City from all claims for infringements on patented design, devices, material, process or any trademark or copyright during the prosecution or after the completion of the Project.

5.16.3. If any design, device, material, process or product of a particular manufacturer covered by letters patent or copyright is specified for use by the Drawings and Specifications, the City is responsible for any claims for infringement by reason of the use of such design, device, material, process or product of a particular manufacturer; but the Contractor shall pay any royalties or license fees required.

5.17. Utilities.

5.17.1. The Contractor shall support, and protect from injury, until completion of the Work any existing power lines, telephone lines, water mains, gas mains, sewers, cables, conduits, ditches, curbs, walks, pavements, driveways, and other structures in the vicinity of the Work that are not authorized to be removed.

5.17.2. The Contractor shall schedule and coordinate all Work with any utilities. The Contractor shall cooperate with utility owners (including electrical, gas, communication, water, sewer and railroad) to mitigate damage (including relocation or removal) whenever the Contractor's work affects their utilities. The Contractor shall seek to expedite the progress of such work and minimize duplication of work and disruption of services.

5.17.3. The Contractor shall conduct its operations in such a manner as to minimize the inconvenience to the public due to disconnected utilities. The Contractor shall not disconnect any utility without prior approval of the affected utility and the Project Manager. Such utility shall then not be disconnected before 9:00 A.M. and service shall be restored by 4:00 P.M. of the same day. If the Contractor's operations require or cause utility service to be disconnected beyond the time limits stated above, the Contractor shall make arrangements suitable to the Project Manager to provide temporary utility service. Such temporary service shall be at Contractor's expense.

5.17.4. The City will not be responsible or liable for any delay or other impact to the Work caused by the acts or omissions of any utility or related agency.

5.18. Coordination with SACWSD.

The Contractor shall always coordinate its Work with SACWSD. If it becomes necessary to close portions of any water or sewer system due to construction operations, the Contractor will provide at least twenty-four (24) hours prior notice to SACWSD. SACWSD shall have authority to dictate requirements of the closure. It is the Contractor's responsibility to ensure continuity of the utilities.

5.19. Notification of Affected Utility & Property Owners.

5.19.1. The Contractor shall not excavate without first notifying all owners, operators, or association of owners and operators having underground facilities in the area of such excavation. Notice may be given in person, by telephone or in writing. Notice to an association is notice to each member of the association.

5.19.2. The Contractor shall contact the Utility Notification Center of Colorado at least forty-eight (48) hours before the start of any excavating.

5.19.3. The Contractor shall give such notice of the commencement, extent, and duration of the excavation work at least forty-eight (48) hours before beginning Work affecting the area.

- 5.19.4. If the Project affects fences, landscaping, mailboxes, driveways or other improvements, the Contractor shall notify the affected property owners or occupants IN WRITING at least forty-eight (48) hours before beginning Work. The Contractor shall cooperate with the owners or occupants to reduce inconvenience where reasonably possible.

5.20. Compliance with Laws; Licenses and Permits.

- 5.20.1. The Contractor shall perform all obligations under the Contract in strict compliance with all applicable federal, state, and municipal laws, rules, statutes, charter provisions, ordinances, and regulations.
- 5.20.2. The Contractor and its employees, agents and Subcontractors, while performing the Work or while on City property for any reason during the Term, shall adhere to the City's policies applicable to City employees regarding drugs, alcohol and workplace violence.
- 5.20.3. The Contractor will obtain, at its cost, all licenses and permits required to do the Work by City, county, state, federal, or other applicable law or regulation. A Subcontractor shall also have the proper permits applicable to the Work to be performed by the Subcontractor.

5.21. Protection of Persons.

- 5.21.1. The Contractor is responsible for the health and safety of all persons on or at the Work site and shall take all necessary and reasonable precautions and actions to protect all such persons from injury, death, or loss.
- 5.21.2. The Contractor and any Subcontractor shall not require any laborer, mechanic or other person employed in performance of the Work to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous to health or safety. The Contractor and all Subcontractors shall comply with all applicable safety rules and regulations adopted by the United States Department of Labor Occupational Safety and Health Administration (OSHA), the Industrial Commission of the State of Colorado or the City of Commerce City, whichever is most restrictive. The City assumes no duty to ensure that the Contractor follows the safety regulations issued by OSHA or the State of Colorado.
- 5.21.3. The Contractor shall provide all necessary protective devices and safety precautions. Such devices and precautions may include but are not limited to: posting of danger signs warning against hazards such as, but not limited to, hoists, well holes, elevator hatchways, scaffolding, openings, stairways, trip and fall hazards and falling materials; placement of warning flares; equipment back-up alarms; installation of barricades; promulgation and application of safety regulations and employment of safety personnel and guards. Signs will not be considered to be an adequate substitute for physical protective barriers. The costs of all protective devices and the planning and implementing of safety precautions are considered to be included in the Unit Prices, even if not specified.
- 5.21.4. If, in the opinion of the Project Manager, the Contractor has not supplied necessary and adequate barricades, warnings, or other safety devices, then the City may order additional devices and deduct the cost from the Contractor's payment. By taking such action, the City assumes no liability for the adequacy of such barricades, warnings or other safety devices.

- 5.21.5. For operations involving trenching, excavation or any other underground construction, the Contractor's attention is specially directed to and its work shall conform to the Construction Safety and Health Regulations, Part P Subparagraph 1926.6013-6016 by OSHA, latest revision.
- 5.21.6. The Contractor and all Subcontractors shall always, whether or not so specifically directed by the Project Manager, take necessary precautions to ensure the protection of the public. The Contractor shall furnish, erect, and maintain at its own expense all necessary precautions for the protection of the Work and safety of the public through and around its construction operations.
- 5.21.7. The Contractor shall make the provisions of this section a condition of each contract with any Subcontractor.

5.22. Protection of Property.

- 5.22.1. The Contractor shall continuously take all reasonable precautions to protect from damage, injury or loss, all or any part of the Work and all or any part of materials or equipment to be incorporated in the Work, whether in storage on or off the Work site, under the care, custody, control of the Contractor or any Subcontractor or Supplier. The Contractor shall repair or replace at its expense any such damage, injury or loss, except such as may be directly due to error in the Contract or caused by agents or employees of the City.
- 5.22.2. The Contractor shall provide and maintain at its expense all passageways, barricades, guard fences, lights, and other protection facilities required by public authority or local conditions.
- 5.22.3. The Contractor is responsible for protection of all public and private property on and adjacent to any site of the Work. The Contractor shall use every precaution necessary to prevent damage to curbs, sidewalks, driveways, trees, shrubs, sod, mailboxes, fences, and other private and public improvements. The Contractor shall protect carefully from disturbance or damage all land monuments and property markers until an authorized agent has witnessed or otherwise referenced their locations, and shall not remove them until directed.

5.23. Protection of Historical Sites.

When the Contractor's operations encounter remains of prehistoric peoples, dwelling sites or artifacts of historical or archeological significance, the Contractor shall temporarily discontinue such operations and immediately advise the Project Manager. The Project Manager will contact archeological authorities to determine the disposition of the items in question. When directed, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and remove them for delivery to the custody of the proper authorities. Such excavation is considered, and paid for, as extra Work.

5.24. Responsibility to Repair.

- 5.24.1. When any direct or indirect damage or injury is done to any public or private property or utility by or on account of any act, omission, neglect or misconduct in the execution of the Work, the Contractor shall restore the damaged property at its own expense to a condition equal to or better than that existing before such damage or injury.

- 5.24.2. If any existing property is damaged in the Work as a result of Contractor's non-performance, the Contractor shall immediately notify the property owner. The Contractor shall not attempt to make repairs unless authorized in writing by the property owner or directed by the Project Manager. Written authorization from the owner to make repairs must be so worded as to save the City harmless from any responsibility whatsoever relative to the sufficiency of the repairs. The Contractor shall give the Project Manager a copy of the written authorization to make repairs.
- 5.24.3. The Contractor shall replace any materials and equipment lost, stolen, damaged or otherwise rendered useless during the performance of Work on the Project.
- 5.24.4. At the Contractor's cost, the City may undertake any such repair or replacement required by this section when the Contractor fails to do so within a reasonable time. The City may deduct any such cost from any payment due the Contract or may recover such costs from the Contractor or the Surety..

5.25. Hazardous & Explosive Materials & Substances.

- 5.25.1. If the Contractor encounters or discovers any hazardous materials or substances during its performance of the Work, it shall immediately take reasonable precautions concerning such hazardous material or substances and notify the Project Manager verbally and in writing of the existence of such materials or substances immediately upon discovery.
- 5.25.2. The Contractor shall exercise the utmost care and caution if the storage or use of hazardous materials or substances or explosives are required for the performance of the Work. Activities related to the purchase, storage, handling, use, removal, treatment, or disposal of such hazardous materials or substances or explosives shall at all times be the sole responsibility of the Contractor and shall be supervised and carried out by personnel properly qualified to perform such activities. However, under no circumstances shall activities requiring the purchase, storage, handling, use, removal, treatment or disposal of hazardous materials or substances or explosives be initiated without first notifying the Project Manager in writing of the proposed activity and receiving the Project Manager's written approval of such activity. The use, handling and storage of explosives will not be allowed on site unless they are required or explicitly permitted by the Specifications

5.26. Cleaning Up and Restoration.

- 5.26.1. The Contractor shall clean up and lawfully dispose of all refuse or scrap materials so the site presents a neat, orderly, and workmanlike appearance at all times. The Contractor shall follow all direction from the Project Manager as to the appearance of the site at all times.
- 5.26.2. The Contractor shall remove all mud or other materials tracked or otherwise deposited on any roadway daily or as directed by the Project Manager.
- 5.26.3. Upon completion of the Work, and before Final Inspection, the Contractor shall remove from the construction site and any occupied adjoining property all plants, buildings, refuse, unused materials, forming lumber, sanitary facilities, and any other materials and equipment that belong to the Contractor or any Subcontractors. The Contractor shall clean and replace any broken or scratched windows, clean and repair all surfaces, and clean and adjust all units of equipment that are part of the Work. Final

Payment will not be made until all cleanup is done to the Project Manager's satisfaction.

- 5.26.4. At the Contractor's cost, the City may clean up and restore the construction site satisfactorily when the Contractor fails to do so within two (2) days of the Project Manager's direction. The City may deduct any such cost from any payment due the Contract or may recover such costs from the Contractor or the Surety.

5.27. **Pest & Vector Control.**

The Contractor will be responsible for pest control and vector control at the Work site until Substantial Completion. All pest and vector control activities shall be conducted in compliance with applicable laws, including ordinances, statutes and regulations governing the handling, storage and application of pesticides or other hazardous materials and substances.

5.28. **Traffic Control.**

- 5.28.1. The Contractor shall arrange Work to disrupt traffic as little as possible. All traffic Control Devices used shall conform to the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD). Except as otherwise permitted, two way traffic shall be maintained at all times in public roadways.
- 5.28.2. At least seven (7) days before starting any Work in City right-of-way, the Contractor shall submit a detailed traffic control plan for review from the Public Works Department, with a copy to the Police Department. The approval shall establish the requirements for closures related to the number of lanes and time of day lanes or streets may be closed in accordance with the MUTCD and other applicable criteria or regulations. The Traffic Control Plan (TC Plan) shall include the name of the Contractor, the name and phone number of the person responsible for the traffic control, the date for beginning and ending construction activity and hours of operation expected. The TC Plan should show the widths of streets involved, traffic lanes, the size and location of the Work area with distances from the curb, distance to the nearest intersection, detours, parking areas, access to private property, and the type and location of traffic control devices. No changes to the TC Plan shall be permitted without prior approval by the Public Works Director.
- 5.28.3. The Contractor, at its cost, shall furnish and maintain all necessary signs, barricades, lights, and flaggers necessary to control traffic and provide for safety of the public, all in compliance with the MUTCD with subsequent revisions and additions, and to the satisfaction of the Public Works Director. No construction signs shall be placed on sidewalks unless construction is actually taking place on the sidewalk. During evening hours and when not in use, all signs shall be turned away from traffic and moved at least eight (8) feet away from the edge of the nearest traveled way.
- 5.28.4. Whenever a police officer is necessary for traffic control, the Contractor shall hire and pay a uniformed off-duty police officer with authority in the City to direct traffic. The police department will determine the rate of pay for the officers.
- 5.28.5. The Contractor shall make its Traffic Control plans in concurrence with any Traffic Control requirements that may be specifically stated in the Special Conditions.

- 5.28.6. The City may impose a price reduction charge for any recurrence of an incident under

the TC Plan, after notification by the Project Manager, according to the following schedule. The price reduction charge will not be considered a penalty, but will be a price reduction for failure to perform traffic control in compliance with the Contract. For purposes of this section, an “incident” is any violation of the TC Plan lasting up to thirty (30) minutes; each successive or cumulative 30-minute period in violation of the TC Plan will be deemed a separate incident, as determined by the Project Manager.

Incident	Price Reduction Charge
First	None – Notice from Project Manager
Second	\$150.00
Third	\$300.00
Fourth	\$600.00
Subsequent	\$1,200.00

5.29. Sanitary Regulations.

- 5.29.1. The Contractor is responsible for providing proper health and sanitation facilities for its employees, in compliance with any rules and regulations of the Colorado Department of Public Health and Environment or any other agencies having jurisdiction.
- 5.29.2. The Contractor shall always provide an abundant supply of safe drinking water for its employees and shall give orders against the drinking of any water known to be unsafe in the vicinity of the Project.
- 5.29.3. At convenient places, the Contractor shall provide fly-proof outside toilets which are to be maintained in a sanitary condition. Toilets shall not be permitted in any reservoir area and shall not be permitted where they may pollute a water supply.
- 5.29.4. The Contractor shall provide and empty daily a thirty (30) gallon or larger trash can near each toilet.

5.30. Pollution Control.

- 5.30.1. The Contractor shall comply with all applicable Federal and State laws, orders, and regulations concerning the control, prevention, and abatement of water pollution and air pollution in all operations pertaining to the Contract whether on right-of-way provided by the City or elsewhere.
- 5.30.2. The Contractor shall use construction methods that prevent release, entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes including, but not restricted to refuse, garbage, cement, concrete, sewage effluent, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution. Non-regulated solid wastes shall be disposed of by methods approved under applicable laws and regulations, including, the Resource Conservation and Recovery Act (RCRA), Subtitle D, as administered by Colorado and local Health Departments and the EPA.
- 5.30.3. Contaminated and hazardous materials are regulated by RCRA, Subtitles C and D. The Contractor shall notify the Colorado Department of Public Health and Environment, local health departments, and local fire departments if suspect materials are encountered.

- 5.30.4. The Contractor shall utilize methods and devices that are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants including dust in its construction activities and operation of equipment.
- 5.30.5. The Contractor shall not emit dust into the atmosphere during any operations, including but not limited to: grading; excavating; manufacturing, handling or storing of aggregates; trenching; or cement or pozzolans. The Contractor shall use the necessary methods and equipment to collect, deposit, and prevent dust from its operations from damaging crops, orchards, fields or dwellings or causing a nuisance to persons. The Contractor is liable for any damage resulting from dust.
- 5.30.6. The Contractor may not operate equipment and vehicles with excessive emission of exhaust gases due to improper mechanical adjustments, or other inefficient operating conditions, until repairs or adjustments are made.
- 5.30.7. Burning trash, rubbish, trees, brush or other combustible construction materials is not permitted unless the Contractor has obtained a valid burning permit issued by the Tri-County District Health Department or successor agency. Any such burning shall be conducted in accordance with permit requirements.
- 5.30.8. De-watering for structure foundations or earthwork operations adjacent to or encroaching on lakes, streams or watercourses shall be done in a manner which prevents muddy water and eroded materials from entering the lakes, streams or watercourses, by construction of intercepting ditches, bypass channels, barriers, settling ponds or by other approved means. Excavated materials may not be deposited or stored in or alongside lakes or watercourses where they can be washed away by high water or storm runoff.
- 5.30.9. The Contractor will not allow wastewater from aggregate processing, concrete batching or other construction operations to enter lakes, streams, watercourses or other surface waters without turbidity control methods such as settling ponds, gravel-filter entrapment dikes, approved flocculation processes that are not harmful to fish, recirculation systems for washing of aggregates or other approved methods. Any wastewaters discharged into surface waters shall conform to applicable discharge standards of any agency having jurisdiction over the discharge, including the Colorado Department of Public Health and Environment and any federal agency.

5.31. Staging and Storage.

- 5.31.1. With the Project Manager's approval, the Contractor may obtain sites of his/her choosing for equipment storage and/or materials stockpiling. The Contractor shall not occupy storage sites without prior written approval by the Project Manager. A list of such sites showing the proposed truck route for ingress and egress for each site shall be submitted to the Project Manager for approval at least five (5) days prior to intended use.
- 5.31.2. For all sites approved and used, Contractor shall be responsible for the following:
 - a) Obtaining prior written permission of the owner. A copy of this permission shall be provided to the City;
 - b) Keeping stockpiles and equipment confined within the approved area and in accordance with applicable erosion control requirements;

- c) Providing security for materials and equipment at the site;
- d) Providing for public safety at the site;
- e) Keeping access roads clean and in good condition and in accordance to the City's Erosion Control requirements; and
- f) At Contractor's sole cost expense, restoring the site to its original or better condition at the completion of the Work.

5.32. Salvage.

Items removed by Contractor shall become the property of Contractor unless other disposition or repositioning is required by the Contract Documents or needed for the Work. The Contractor may reuse such items elsewhere or on other contracts, sell such items with proceeds of said sale becoming the property of Contractor or otherwise dispose of such items from the site. Items removed by the Contractor that do not have any salvage value are to be disposed of by Contractor at an approved dump at the Contractor's expense.

ARTICLE 6 CITY'S GENERAL RESPONSIBILITIES

6.1. City Performance.

- 6.1.1. The City will furnish the data, perform acts, and make payments as required by the Contract Documents.
- 6.1.2. The City shall not supervise, direct, or have authority or control over, nor be responsible for, the Contractor's means, methods, techniques, sequences, or procedures of construction or safety precautions, or any failure of the Contractor to comply with any laws or regulations applicable to the Work. The City will not be responsible for the Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.
- 6.1.3. The City's promise to pay for the Work that the Contractor promises to perform is limited by the City's Charter and its ordinances. A payment obligation of the City under this Contract, whether direct or contingent, shall extend only to funds appropriated by the City Council for the purpose of the Contract, encumbered for the purpose of the Contract and paid into the City or otherwise lawfully made available by the City. Unless authorized by law, (i) the City does not by this Contract irrevocably pledge present cash reserves for payments in future fiscal years, and (ii) this Contract is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of the City. Other limitations are found in the law that the Contractor is presumed to know. Three such limitations on payment are listed below:
 - a) Under no circumstances will the City be liable for any extra Work that has not been authorized by a properly executed Change Order or Field Order.
 - b) No Change Order, Field Order, or other form of directive to the Contractor shall be issued, and no such order or directive shall be binding if issued, if: (i) it would directly cause the aggregate amount payable under the Contract to exceed the amount appropriated or otherwise lawfully made available for the Contract, or (ii) it would require the Contractor to perform additional compensable work which would cause the aggregate amount payable to exceed such appropriated or provided amount.
 - c) It shall be the Contractor's responsibility to verify that the amounts already

appropriated or otherwise made available for the Contract are sufficient to cover the entire costs of the Work. Any work undertaken or performed in excess of the amount appropriated or otherwise made available is undertaken or performed in violation of the terms of the Contract, without the proper authorization, and at the Contractor's own risk.

- 6.1.4. Any limitations on the sources of funding for payments made under the Contract are stated in the Contract Documents.

6.2. Project Manager.

- 6.2.1. The Project Manager is designated by the City to exercise all authority on its behalf under the Contract and to see that the Project is completed according to the Contract Documents. The Project Manager may be changed by written notice to the Contractor.
- 6.2.2. The Project Manager may assume exclusive control of the performance of the Contractor in the case of non-performance or if there is an imminent threat to life or safety of persons or property.
- 6.2.3. The Project Manager will furnish all explanations, directions, stakes or markers, and inspections necessary to carry out and complete the Project. No inspection, explanation or direction by the Project Manager shall be deemed authority for Contractor to deviate from the requirement that the Work be performed in accord with the Contract Documents.

6.3. Right to Bar Persons from the Work and Site.

The City reserves the right to bar any person, including employees of the Contractor and Subcontractors, from the Work site by order of the Project Manager. This shall not be treated as a request for the employee's termination but a request that the employee not be assigned to work on the City Work site. No increase in contract time or price is authorized as a result of the City's exercise of this section.

6.4. Access to Work.

- 6.4.1. The City, its representatives, and participating federal or state agencies and other public authorities having jurisdiction established by law shall have access to the Project and Work site at any time for any purposes, including without limitation inspection, sampling, and testing. The Contractor shall provide proper facilities for access to the Project.
- 6.4.2. Access means wherever and whenever the Work is in manufacture, preparation or progress and includes access to payrolls, records of personnel not protected from disclosure by law, invoices of materials, terms and conditions of sale of materials and equipment to be incorporated in the Project, files, records, books, correspondence, instructions, Drawings, receipts, subcontracts, purchase orders, vouchers, memoranda and any other relevant data and records relating to the Contract.
- 6.4.3. The City may, at reasonable times, inspect the part of the plant, place of business or worksite of the Contractor or Subcontractor at any tier that is pertinent to the performance of the Contract.

6.5. Inspection.

- 6.5.1. The City shall appoint Inspectors to inspect the Project. Inspection may extend to all or any part of the Work. Inspectors are not authorized to alter any Contract Documents or to delay the fulfillment of the Contract by failure to inspect materials and Work with reasonable promptness. Inspectors are not authorized to act as foreman for the Contractor.
- 6.5.2. Inspectors may perform any tests and observe the Work to determine whether or not designs, materials used, manufacturing, and construction processes and methods applied, and equipment installed satisfy the requirements of the Contract Documents and the Contractor's warranties and guarantees.
- 6.5.3. Inspectors assigned to the Work by the City are authorized to reject any Work, any materials, or any component of the Work and to suspend any Work that is not being done as required or specified in the Contract Documents. Such rejection or suspension will be confirmed by the Project Manager in writing to the Contractor
- 6.5.4. The Contractor shall give the Project Manager due and timely notice of readiness when the Project is to be inspected, tested, or approved by someone other than the Inspector. The Contractor shall give the Project Manager required certificates of inspection, testing, or approval. Inspection, tests, or approvals by the Project Manager or others do not relieve the Contractor from its obligations to perform the Work according to the requirements of the Contract.
- 6.5.5. If the Project Manager considers it necessary or advisable that previously completed or covered Work be inspected or tested, the Contractor shall uncover, expose or otherwise make the Work available to the Project Manager at the Contractor's expense for inspection and testing. The Contractor shall furnish all tools, labor, material, and equipment necessary to make the Work available. If the Project Manager finds the Work defective, the Contractor shall pay for the cost of satisfactory reconstruction and making the Work available. However, if the Work is not found defective, the Contractor will be allowed an increase in the Contract Price and/or an extension of the Contract Time for costs and time directly attributable to making the Work available and for reconstruction unless covered by the Contractor before any required inspection hold point.
- 6.5.6. If the Contractor's operations require inspecting, testing or surveying to be done outside normal working hours (7 a.m. to 5 p.m.) or on weekends or City holidays, the cost of such overtime shall be at the Contractor's expense. The fee charged shall not exceed fifty dollars (\$50) and shall be charged "portal to portal" from the Inspector's workplace.
- 6.5.7. Inspections shall not be construed to relieve the Contractor of quality control responsibilities or full compliance with the Contract Documents.

ARTICLE 7 SUSPENSION OF WORK

7.1. General.

- 7.1.1. The City may suspend all or any part of the Work by written order signed by the Project Manager, without invalidating the Contract, for such period or periods as it may deem necessary due to:
- a) Any reason for the convenience of the City, with or without cause, including but not limited to the availability of funding for the Project;
 - b) An order from a state or federal court or administrative agency; or
 - c) The Contractor's failure to perform any provision of the Contract Documents.
- 7.1.2. Upon receipt from the Project Manager of an order to suspend the Work, the Contractor shall, within three (3) days, submit a suspension plan to the Project Manager for acceptance. The plan shall describe how the Contractor will store all materials in a manner so that the materials will not become an obstruction or become damaged in any way, what cost effective methods it will employ to prevent damage to or deterioration of the Work and otherwise protect the Work, how suitable drainage will be provided, what temporary structures will be necessary, and how the Contractor will prepare for resuming the Work for the least possible remobilization cost. After the plan is accepted, the Contractor shall implement it in accordance with instructions received from the Project Manager.
- 7.1.3. Under no circumstance shall a suspension absolve the Contractor or the Contractor's sureties of the duties and responsibilities guaranteed under the Bonds.
- 7.1.4. The Contractor shall again proceed with the Work when it is ordered to do so in writing by the Project Manager.
- 7.1.5. Upon the resumption of the Work for all suspensions not involving the Contractor's failure to perform in accord with the Contract Documents, adjustment of Contract Time, if appropriate, will be made in accordance with these General Conditions. Adjustment of the Contract Price, if any, will be within the City's sole discretion and shall not in any event, exceed the cost of the extra work resulting from such suspension. Such cost, if any, shall be determined in accordance with these General Conditions.

7.2. Suspension of Work for the City's Convenience.

- 7.2.1. Upon decision to suspend the Work or any part of the Work for the City's convenience, the order of suspension will extend the Contract Time for the number of days of such suspension if all Work is suspended. If the suspension applies to only a part of the Work, a time extension will not be authorized until the partial suspension has run and its effect on the entire Contract can be evaluated. In all cases of suspension for the City's convenience, the costs to the Contractor will be determined in accordance with these General Conditions.
- 7.2.2. Upon order of such suspension, the Contractor shall immediately begin to perform in a manner designed to minimize the costs of protecting the Work and maintaining it in a condition which will permit its resumption for the least possible remobilization cost.

7.3. Suspension of Work Due to Order of City, State, or Federal Court or Agency.

The order of suspension will identify the court or agency order which caused the suspension and will extend the Contract by the amount of time specified by the court or agency order. If the order causes suspension for an indefinite period of time and as a

result a time extension cannot be established, the order of suspension will also be for an indefinite period of time. If the order is issued because of acts or omissions of the Contractor, the Contractor shall not be entitled to a time extension or payment for any additional costs it incurs.

7.4. Suspension of Work Resulting from Contractor's Failure to Perform.

If a suspension order results from the Contractor's failure to satisfactorily perform any of the provisions of the Contract, including but not limited to faulty workmanship, safety concerns, improper or inadequate manpower, equipment, supplies or supervision, or failure to perform the Work in a timely manner, the order will identify the reason, or reasons, for the order. In this circumstance, no time extension will be authorized for the Contractor and any costs to the Contractor resulting from such suspension order will not be reimbursed by the City. A suspension order issued under these circumstances will remain in effect until the Contractor has removed or corrected the grounds for the suspension, if applicable, or the order requiring such suspension expires by its terms

ARTICLE 8 WARRANTIES AND GUARANTEES

8.1. The Contractor and its Surety are jointly responsible for maintenance and satisfactory operation of all Work performed under the Contract for a period of one (1) year following the later of Notice of Substantial Completion or until warranty work is fully satisfied. Neither the Contractor nor Surety is liable for any failure resulting from the City's neglect or improper operation of facilities or the act of a third party for whom the Contractor is not responsible.

8.2. The Contractor and its Surety are responsible for the prompt and satisfactory repair or replacement of any Work, materials or equipment which is found defective during this period (including design costs), provided any failure results directly or indirectly from faulty workmanship or negligence by the Contractor or any Subcontractor or from faulty manufacturing or from faulty erection or improper handling of materials or equipment furnished or installed by the Contractor or any Subcontractor. The Contractor and its Surety shall promptly replace any materials and re-perform any portion of the Work found to be defective within this period in accordance with the Contract and without expense to the City.

8.3. Nothing in this section shall limit the City's right to seek recovery for latent defects that are not observable until after the warranty or guarantee periods have run.

8.4. All Subcontractors', manufacturers', and Suppliers' warranties and guarantees, express or implied, for any part of the Work and any materials used in the Work shall be obtained and enforced by the Contractor for the benefit of the City whether or not these warranties and guarantees have been assigned or otherwise transferred to the City. The Contractor shall assign or transfer such warranties and guarantees (including those of any longer term) to the City if the City requests the Contractor to do so, but such transfer shall not affect the Contractor's obligation to enforce such warranties and guarantees.

8.5. Performance During Warranty Period.

8.5.1. The Project Manager will notify the Contractor of defective Work that is found to be defective and fails to satisfy the warranties and guarantees described in this article, or elsewhere in the Contract Documents, and the Contractor shall, within ten (10) days or such longer time as may be requested and set forth in the notice, commence the

repair, replacement, or correction of the defective Work. If the Contractor fails to complete such Work within a reasonable period, the City may make the repairs or replacements at the expense of the Contractor. If the City determines that immediate action to make repairs, replacements or other corrections is necessary because of emergency conditions or to prevent further loss or damage, the City may proceed without notice to the Contractor, but at the expense of the Contractor.

- 8.5.2. If the Contractor does not proceed with the correction of such defective Work within the time fixed by written notice from the Project Manager, or if an emergency condition exists, the City may remove and store any defective materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of the removal and storage within ten (10) days thereafter, the City may, upon ten (10) additional days' written notice, sell the stored Work at auction.
- 8.5.3. If the proceeds of sale do not cover all costs that the City has incurred and which the Contractor should have borne, the difference shall be charged to the Contractor and the Contractor and its surety shall be liable for and pay such difference to the City.
- 8.5.4. If the Contractor does not agree that the Work is defective or the defective Work is its responsibility and if no emergency condition exists, the Contractor may request review, in writing, of the Project Manager's decision in accordance with these General Conditions. If such review is not requested within ten (10) days of the notification of defective Work, the Contractor shall have waived the right to contest its responsibility for the correction of the defective Work. Under emergency conditions, the Contractor shall immediately correct the alleged defective Work, and the question of responsibility for the expense shall be determined by the Project Manager, subject to the right of the Contractor to seek review within ten (10) days of the City's notice allocating responsibility for the expense.
- 8.5.5. Should the City claim by written communication sent or mailed before the warranty or guarantee period expires that certain defective Work exists and that it requires repair or replacement, the warranty and guarantee period shall be automatically extended for as long as the defective Work exists.

ARTICLE 9 CHANGES

9.1. General.

- 9.1.1. The Contractor shall perform the Work, as changed by any Change Order, as if originally specified. All changes shall be accomplished by either a written Change Order or a written Field Order issued in accordance with these General Conditions. If a Field Order is used, a Change Order will be executed when the terms of the change are agreed upon.
- 9.1.2. Changes to the Contract Price and Contract Time are authorized only by Change Orders.
- 9.1.3. Any plan of action, method of work, or construction procedure suggested orally or in writing to the Contractor by any City employee, agent or representative, which is not set out in Change Orders or Field Orders issued in accordance with the Contract Documents, if adopted or followed by the Contractor in whole or in part, shall be performed at the Contractor's sole risk and responsibility.
- 9.1.4. The Contractor may not treat any order, statement or conduct of the Project Manager as a change under this article nor become entitled to an equitable adjustment in the

Contract Price or Contract Time except as provided in this article.

9.1.5. Claims for changes in the Contract Price or Contract Time of Performance will not be considered after the Final Payment has been made.

9.1.6. Change Orders involving an increase in the Contract Price must be authorized as follows:

- a) Up to \$5,000 – Division Manager or above (or other as delegated by Division Manager)
- b) Up to \$50,000.00 – Department Director or above (or other as delegated by Department Manager)
- c) Up to \$250,000.00 – City Manager
- d) Over \$250,000.00 – City Council

9.2. City Change Request.

9.2.1. The City may, without notification to any Surety, require the Contractor to perform additive or deductive changes to the Work within the general scope of the Project without invalidating the Contract or any Bond.

9.2.2. When the City desires to initiate a change, the Project Manager will issue a change request informing the Contractor of the proposed change in the Work, and requesting the Contractor's detailed price proposal for such change. The Contractor, at no expense to the City and within the time period specified in the Change Request, shall provide the Project Manager with a complete and itemized proposal for the change in the Work, which shall include the estimated increase or decrease in the Contract Price or Contract Time. Such increase or decrease shall be based on the criteria and methods described in these General Conditions. The Contractor shall be responsible for any delays in the Work and any additional costs to the City caused by the Contractor's failure to submit a complete price proposal within the time provided. The Contractor shall participate with the City in prompt joint analysis and negotiations to finalize a Change Order. The issuance of a Change Request by the City is not a prerequisite to the issuance of a Field Order.

9.3. Field Orders.

9.3.1. The Project Manager may make changes in the details of the Project at any time, by issuing a Field Order. Upon receipt of a Field Order, the Contractor shall promptly sign the Field Order and return it to the Project Manager, and shall promptly proceed with performing the change in the Work.

9.3.2. A Field Order may be used when:

- e) The City determines that the Contractor must proceed immediately to perform a change in the Work in order to avoid an adverse impact on the schedule or other work, or to avoid or correct a situation where the health or safety of persons may be affected, and sufficient time is not available to negotiate a Change Order; or
- f) The City and Contractor have not completed their negotiation and reached agreement on all of the terms of a Change Order, but the City requires the Contractor to proceed without such agreement.

9.3.3. If the Contractor believes that such Field Order entitles it to a change in Contract Price or Contract Time, or both, the Contractor shall give the Project Manager written notice within five (5) days after the receipt of the Field Order. Within twenty (20) days after receiving the Field Order, the Contractor shall provide the Project Manager with a complete and itemized proposal that includes the estimated increase or decrease in the Contract Price or Contract Time, or both, attributable to the changes based on the criteria and methods described in these General Conditions. The Contractor shall be responsible for delays to the Work and any additional costs incurred by the City caused by its failure to submit complete pricing information within the time provided above.

9.3.4. Time and Materials.

- a) If the maximum cost of the change in the Work to be performed under a Field Order has not been agreed upon and reduced to writing in the actual Field Order, or if such change is not fully described under a Unit Price set forth in the Contract Documents or the Field Order, the Contractor shall proceed with such Work on a time and materials basis.
- b) Whenever Work is performed on a time and materials basis, the Contractor shall fully document all costs associated with such Work. Beginning with the first day such Work is performed and on a daily basis thereafter, the Contractor shall submit to the Project Manager a daily itemization of all such costs in such form as the Project Manager may require.
- c) The final Contract adjustment for Field Order changes in the Work performed on a time and materials basis shall be calculated in accordance with these General Conditions.

9.3.5. When the City and the Contractor reach agreement on an adjustment to the Contract Price or Contract Time, or both as appropriate, such agreement shall be promptly executed as a Change Order. If the City requires Contractor to perform additional compensable work under a Field Order prior to executing a Change Order, the Contractor shall submit its costs to perform the work as periodically completed in its monthly application for payment, and City shall reimburse such costs, subject to retainage and any applicable withholding. In no instance shall the City be required to periodically reimburse Contractor for such additional compensable work prior to Contractor submitting to City an estimate of the cost of the additional compensable work to be performed.

9.4. **Contractor Change Requests.**

9.4.1. If the Contractor: (i) receives any instructions, interpretations or directives which it believes are at variance with the Contract Documents or would require the Contractor to accelerate or decelerate the Work; or (ii) identifies what it believes are errors or omissions of any kind, including design errors or omissions, in the Drawings or Specifications; or (iii) encounters a differing site condition; or (iv) is delayed in performing the Work; or (v) becomes aware of any other matter or circumstance that the Contractor believes might require a change in the Contract Documents, Contract Time, or Contract Price, the Contractor shall give the Project Manager prompt written notice of such matter and request a Change Order in a document identified as a "Contractor Change Request."

9.4.2. Following submission of a Contractor Change Request, the Contractor shall diligently continue performance of the Contract to the maximum extent possible.

9.4.3. All Contractor Change Requests shall be dated, numbered sequentially, and shall describe the action or event that the Contractor believes may require the issuance of a Change Order. The Contractor shall also provide a description of possible Contractor actions or solutions to minimize the cost of the Contractor Change Request and, when possible, provide an estimate of the adjustment in the Contract Time and Contract Price which the Contractor believes is appropriate.

9.4.4. Time Requirements.

- a) With respect to orders, instructions, directives, interpretations, determinations, or the discovery of any errors or omissions in the Contract Documents, a Contractor Change Request shall be submitted before the Contractor acts on them, but in no event more than five (5) days after they have been, or reasonably should have been, received or discovered.
- b) With respect to any differing site conditions, a Contractor Change Request shall be submitted before the conditions are disturbed, but in no event more than five (5) days after the conditions are first discovered or reasonably should have first been discovered.
- c) With respect to delays, as set out in these General Conditions, a Contractor Change Request shall be submitted as soon as the Contractor becomes aware, or reasonably should have become aware, of the delay, but in no event more than five (5) days therefrom.
- d) With respect to any other matter or circumstance that the Contractor believes would require a change, a Contractor Change Request shall be submitted as soon as the Contractor reasonably has knowledge of the matter or circumstance, but in no event more than five (5) days after the Contractor becomes aware, or reasonably should have become aware, of such circumstance or matter.

9.4.5. Submittal Requirements and Waiver of Claims.

- a) If the Contractor does not submit a Contractor Change Request within the time required by these General Conditions, any action by the Contractor related to such order, direction, instruction, interpretation, determination, design error or omission, or other matter, including delays or differing site conditions, will not be considered by the City as a change to the Work and the Contractor waives any claim for an adjustment on the Contract Price or the Contract Time.
- b) The Contractor shall, within ten (10) days after submitting a Contractor Change Request, provide the Project Manager with a complete and itemized proposal that sets out as specifically as practicable the requested adjustments to Contract Price, Contract Time, or other Contract provisions, and contains the other information described in these General Conditions.
- c) The proposal shall also contain a detailed explanation, citing all applicable provisions in the Contract Documents that support the Contractor Change Request. If the Contractor does not submit its itemized proposal for a Change Order within the time described above or within such extension that the Project Manager, in his or her discretion may have granted in writing, the Contractor waives any claim for an adjustment in the Contract Price or Contract Time arising out of the act or event giving rise to or necessitating a Contractor Change Request.
- d) The Contractor shall furnish, upon request, all additional information and data that the Project Manager determines is needed to assist the City in evaluating and

resolving the Contractor Change Request through negotiation. The Contractor shall give the City access to its books, correspondence, records, electronic data bases and files, and other materials relating to the work described in the Contractor Change Request, shall require its Subcontractors and Suppliers to provide the City with such access, and shall make its personnel and that of its Subcontractors and Suppliers available to discuss and answer cost, schedule, and other questions related to such request. Clear and legible copies of all necessary supporting records shall be provided to the City at no cost. Failure to submit requested information may be a basis for denial of the request.

9.4.6. Specific Provisions for Delay-Based Contractor Change Requests.

If the Contractor Change Request is based in whole or in part on a delay of any kind or nature, the complete itemized proposal shall include the following information in addition to all other required information:

- a) The date, nature, and circumstances of each event regarded as a cause of the delay;
- b) The names of all individuals acting on behalf of the City who are known or believed by the Contractor to have direct knowledge of the delay;
- c) If the Contractor claims acceleration costs of scheduled performance or delivery, the basis upon which acceleration arose;
- d) The identification of any documents and the substance of any oral communications known to the Contractor which substantiate, refute, or concern such delay;
- e) A Critical Path Method (CPM) schedule corrected to reflect actual performance, showing delay impacts as separate tasks and Contractor's mitigation of such impacts; and
- f) The specific elements of Contract performance for which the Contractor may seek an equitable adjustment, including:
 - 1) Identification of each Contract or schedule line item that has been or may be affected by such delay;
 - 2) To the extent practicable, identification of the delay and disruption in the manner and sequence of performance, and the effect on continued performance, that have been or may be caused by such delay;
 - 3) Identification of labor, materials, or both, or other cost items including overhead and Subcontractor costs, that have been or may be added, deleted, or wasted by such delay;
 - 4) A statement that the Contractor is maintaining records by some generally accepted accounting procedure that allows the separately identifiable direct costs due to the delay, and those not incurred as a result of the delay, to be readily identified and segregated; and
 - 5) Estimates of the necessary adjustments to Contract Price, Contract Time and any other Contract provisions affected by the delay.

9.4.7. Determination by Project Manager.

- a) The Project Manager shall respond in writing to any timely Contractor Change Request within ten (10) days of receipt of the complete and itemized proposal in support of the request. Failure of the Project Manager to respond within such time period shall be deemed a denial of the Contractor Change Request unless the

Project Manager notifies the Contractor that additional time is necessary to review the Contractor Change Request.

- b) If a Contractor Change Request is denied by the Project Manager, in whole or in part, any claim for an increase in the Contract Price or Contract Time arising out of the act or event described in the Contractor Change Request is waived unless the Contractor timely submits a protest or dispute in accordance with these General Conditions.

ARTICLE 10 ADJUSTMENT TO CONTRACT PRICE

10.1. Contract Price Adjustments.

All adjustments to the Contract Price shall be determined by using one or more of the following methods in descending order:

- 10.1.1. Unit Prices (as stated in the Contract Documents or subsequently agreed upon) multiplied by final verified quantities of work performed and subject to the requirements of paragraph 10.7 below;
- 10.1.2. A negotiated lump sum. If requested by the City, the Contractor shall promptly provide itemized and sufficient substantiating data, including calculations, measurements, cost records, production rates, equipment types and capacity, labor costs by craft and other information that the City may reasonably require the Contractor to produce in order to permit the City to evaluate any lump sum Contractor Change Request. In pricing such proposals, the Contractor shall include estimates of the type of costs described in this article
- 10.1.3. Costs as determined in a manner previously agreed upon by the Parties, which include markups that do not exceed those described in this article.
- 10.1.4. Time and Material costs as determined in the manner described in this article. These amounts may be reduced where necessary to take into account the cost of base Work, Work included in approved Change Orders, Work described in other Field Orders, idle time for workers and/or equipment when Work could have been performed in other locations or when the number of workers or amount of equipment provided exceeded the number or amount required to perform the Work, unsatisfactory Work, or Work that may be or was performed concurrently with the changed Work and which cannot be easily segregated from the changed Work.

10.2. Calculation of the Contract Adjustment.

In no event shall the charge or credit to the City associated with any change exceed the sum of the following:

- 10.2.1. Direct Labor. The actual net, direct increase or decrease in the cost of the Contractor's labor. Such cost shall include only the cost associated with the workers who actually perform the changed Work. The cost of supervision, management and field or office overhead shall not be included or calculated as a direct labor cost. For shop work, the direct labor cost shall include only those workers who work directly on the item being manufactured or the actual operators of the equipment being used to handle the items being manufactured.
- 10.2.2. Labor Burden. Contractor's actual costs for worker's compensation and liability insurance, payroll taxes, social security and employees' fringe benefits (including employer paid health insurance) imposed on the basis of payrolls, and any other benefits provided to employees (including under any applicable collective bargaining

agreement). This burden must reflect the variability of some burdens, i.e., social security. The burden shall be itemized and include all small tools and miscellaneous supplies. The total labor burden for such small tools shall not exceed two percent (2%) of the Direct Labor cost.

10.2.3. Direct Material, Supplies, Installed Equipment. The actual net, direct cost of materials, supplies and equipment incorporated into or consumed by the Work. If actual costs are not available, this cost shall be the lowest commercially available price including all discounts, rebates, shipping and restocking charges, and applicable taxes. Such cost shall be based on buying the material, supplies and equipment in the largest practical quantity to receive quantity discounts.

10.2.4. Equipment Costs. Without markup or operator, the lesser of (i) the actual net cost to the Contractor of owned or rented equipment, other than small tools; or (ii) the rental rate for such equipment as determined by using the following method(s):

a) Equipment rental rates listed in the appropriate rental rate book currently in use by CDOT. If an item of equipment does not appear in the rental rate book currently in use by CDOT, the rental rates published by the Associated Equipment Dealers may be used as a basis for negotiating a rental rate for a particular piece of equipment. The Contractor shall provide all information necessary to determine the appropriate rental rate at the time the equipment is brought on the job. This shall include, but not be limited to, type, description, make, year, model, series, serial number, fuel type, transmission, wheel combination, GVW, capacity and equipment owner.

b) Rental equipment costs shall be determined using actual invoiced rates, less all discounts for basic equipment rental.

c) Mobilization/demobilization costs will be paid if the equipment is mobilized for Work described in a Change Order and is not otherwise to be mobilized or demobilized for the Work at the time. If the equipment is also used on Base Contract Work, no mobilization or demobilization cost will be paid. Mobilization/demobilization costs will be based on using the least expensive means to mobilize or demobilize. Equipment shall be obtained from the nearest available source. When the least expensive methods are used, the costs shown in the actual invoice will be the basis for pricing.

10.2.5. Mark Up For Overhead And Profit.

The Contractor or Subcontractor of any tier who actually performs the Work shall be entitled to a reasonable markup of no more than ten percent (10%) on the actual costs for Direct Labor, Labor Burden, Direct Material, Supplies, Installed Equipment, and Equipment Costs, as described in this article. Bonds and insurance are compensated at direct cost without markup

10.2.6. Bonds, Insurance, Permits And Taxes.

The actual increases or decreases in the cost of premiums for bonds and insurance, permit fees, and sales, use or similar taxes related to the Work.

10.3. **Totals as Equitable Adjustment.**

The Contractor agrees that the total of the above items constitute an equitable adjustment for any and all costs or damages resulting from a change.

10.4. **No Equitable Adjustment for Obstruction by Contractor.**

No equitable adjustment shall be made as a result of costs resulting from any act, hindrance, obstacle, obstruction, interference, or omission of the Contractor, its Subcontractors, Suppliers, or Surety, or any other entity or individual acting on behalf of the Contractor, or any Subcontractor, Supplier, or Surety.

10.5. Calculation of Certain Equitable Adjustments.

10.5.1. In case of delay in completion of the entire Contract due to drawings, designs or specifications that are defective and for which the City is responsible, the equitable adjustment for delays or costs incurred prior to notification to the City of such defect shall only include the extra cost and time reasonably incurred by the Contractor in attempting to comply with the defective drawings, designs or specifications before the Contractor identified, or reasonably should have identified, such defect.

10.5.2. An equitable adjustment shall not include increased costs for delay resulting from the Contractor's failure to continue performance during determination of any Contractor Change Request or claim.

10.6. Price Reductions for Defective Cost or Pricing Data.

If it is later determined that pricing adjustments to the Contract were not correct due to incomplete or inaccurate pricing data by the Contractor or any Subcontractor or Supplier or that lower prices were reasonably available, the price shall be reduced accordingly and the Contract Price modified by an appropriate Change Order.

10.7. Variations in Estimated Quantities.

10.7.1. Where the quantity of a Unit Price pay item in the Contract is an estimated quantity and where the actual quantity of such pay item varies more than 25% below the estimated quantity stated in the Contract, the Contractor shall make an equitable adjustment in the Contract Price, upon demand of the City. The Contract Price adjustment will be based upon any decrease in costs due solely to the variation below 75% of the estimated quantity.

10.7.2. Where the quantity of a Unit Price pay item in the Contract is an estimated quantity and the actual quantity of such pay item is more than 25% above the estimated quantity in the Contract, the City may elect to terminate the Contract for convenience or issue a Change Order to adjust the Contract Price. The Contract Price adjustment will be based upon any increase in costs due solely to the variation above 125% of the estimated quantity.

10.7.3. If the quantity variation is such as to cause an increase in the time necessary for completing the Work, the Contractor may request, in writing, an extension of time in accordance with these General Conditions.

10.8. Disposition of Excess or Obsolete Property.

When the cost of materials, supplies, equipment or other personal property made obsolete or excess as a result of a delay is included in the equitable adjustment, the Project Manager shall have the right to prescribe the manner of disposition of such property.

ARTICLE 11 CONTRACT TIME

11.1. General.

Work shall be fully completed in a satisfactory and acceptable manner by the Completion Date as modified by Change Orders providing for additional time due to excusable delays.

11.2. Delays.

11.2.1. Delay claims fall into three categories: **non-excusable**; **excusable/non-compensable**; and **excusable/compensable**. Any payment for compensable delays or the granting of time extensions for excusable delays requires a properly executed Change Order. The Contractor agrees that time extensions shall constitute full compensation for, and the Contract shall make no claim for monetary damages relating to, any non-excusable delay or any excusable/non-compensable delay.

11.2.2. **Non-excusable delay** is caused by factors within the Contractor's reasonable control or by the Contractor's fault. No additional time or additional compensation is allowed for non-excusable delays. Typical non-excusable delays, without limitation, include:

- a) Late submittal of Shop Drawings;
- b) Late procurement of materials or equipment;
- c) Insufficient personnel;
- d) Unqualified personnel;
- e) Inadequate coordination of Subcontractors or other contractors;
- f) Subcontractor delays;
- g) Late response to City, Project Manager, or Inspector inquiries;
- h) Failure to comply with the requirements of the Contract Documents;
- i) Construction not conforming to contract requirements making repeated re-working necessary;
- j) Delays resulting from the Contractor's failure to take reasonable actions to mitigate or prevent further delays relating to any excusable delay;
- k) Failure to continue performance during the determination of any Contractor Change Request or claim; and
- l) Weather Days exceeding the Reasonably Predictable Weather Days identified on the approved Construction Schedule, unless approved as unusually severe weather days.

11.2.3. **Excusable/Non-compensable delay** is caused by factors beyond the Contractor's reasonable control, but is not the result of the City's actions or omissions. An excusable/non-compensable delay entitles the Contractor to an extension of time but no additional compensation for the cost of the delay. Typical excusable/non-compensable delays, without limitation, include strikes, lockouts, natural fires not caused by Contractor's acts or omissions, unusual delay in transportation, unavoidable casualties, legal or administrative proceedings affecting the Work or the Project, and other causes beyond the Contractor's control.

11.2.4. **Excusable/Compensable delay** is caused by the City's failure to meet an obligation within its control stated or implied in the Contract, but shall not include any action, omission, or exercise of any right under the Contract. If the Project Manager considers a delay as compensable, the City will grant a time extension or reimburse the Contractor for the increased total cost of performance caused by the delay, or both, as

appropriate. Typical excusable/compensable delays, without limitation, include:

- a) Late approval of Shop Drawings and samples;
- b) Delays in answers to field inquiries made by the Contractor;
- c) Interference with the Contractor during construction;
- d) City-caused schedule changes;
- e) Design changes; or
- f) Interference by another contractor's or the City's forces.

11.2.5. **Time Adjustments for Weather Delays.** The Project Manager, in his or her discretion, may deem weather-related delays as excusable/non-compensable if the net number of Weather Days in any month exceeds the number of Reasonably Predictable Weather Days for that month shown on the approved Construction Schedule. The Contractor must submit a weather time impact analysis supporting any request for time extensions due to unusually severe weather.

11.3. **Failure to Complete Work on Time – Liquidated Damages.**

11.3.1. The City may permit the Contractor to proceed if the Contractor fails to advance the Work sufficiently to obtain a Notice of Substantial Completion on or before the Completion Date, as modified by Change Orders providing for additional time due to excusable delays. In such case, the Contractor will pay the sum of liquidated damages stipulated in the Special Conditions for each day that the Work remains uncompleted. This sum shall not be a penalty but is liquidated damages.

11.3.2. The Parties agree that time is of the essence in the performance of this Contract and that actual damages for delay are incapable of calculation. The Parties agree that, under all of the circumstances, the daily basis and the amount set forth as liquidated damages is reasonable and equitable. The City expends additional personnel effort in administrating the Contract or portions of it that are not completed on time, and such efforts and the costs thereof are impossible to accurately compute. In addition, some, if not all, citizens of Commerce City incur personal inconvenience and lose confidence in their government as a result of public projects or parts of them not being completed on time, and the impact and damages, certainly serious in monetary as well as other terms, are impossible to measure.

11.3.3. Permitting the Contractor to continue and finish the Work, or any part of it, after the Completion Date shall not operate as a waiver on the part of the City of liquidated damages or any of its rights under the Contract.

11.3.4. The City may deduct any liquidated damages or any portion thereof due under this article from Final Payment and may sue for and recover such damages from the Contractor and the Surety.

11.3.5. Liquidated damages in the amounts stipulated do not include any sums of money to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. The City reserves all of its rights to actual damages from the Contractor for injury or loss suffered by the City from actions or omissions of the Contractor, including but not limited to any other breach or default of the Contract, outside of the scope of this section.

ARTICLE 12 PAYMENTS TO CONTRACTOR AND COMPLETION

12.1. General.

Unless expressly provided otherwise, the Unit Prices shown in the Bid include the cost of all labor, materials, supplies, equipment, tools, forms, services, utilities, royalties, fees, taxes, profit, overhead, and any other thing or expense, whether temporary or permanent, necessary to complete the Project in accordance with the Contract Documents. Items not shown on the Contract Documents that are necessary to construct the Project will be considered a part of the Project whether specified or not and no separate payment will be made for these items.

12.2. Determination of Amounts and Quantities.

- 12.2.1. The Project Manager or his or her designee shall verify determinations of amounts and quantities of Work performed.
- 12.2.2. The method of measurement of pay items subject to Unit Prices will be as specified in the Special Conditions.

12.3. Monthly Estimates & Progress Payments.

- 12.3.1. The Contractor shall submit signed applications for progress payments on a monthly basis based on partial estimates for all Work completed to date. Applications shall be submitted no later than ten (10) days after the end of the month for Work subject to the application. Applications shall be submitted in a format reflecting the line items for which payment is requested according to the Unit Price Form in the Bid and any applicable Change Order, shall be dated as of the actual date of submittal (or revised submittal, as applicable), and shall reflect the Work completed and the date to which Work has been completed. The Contractor will provide support documentation for all applications, as requested.
- 12.3.2. The signature on each application is a representation by the Contractor to the City that the Work has progressed to the point indicated, that the Work covered by the application is in accordance with the Contract Documents, that the money received as a result of the application will be used to discharge the Contractor's obligations under the Contract, and that the Contractor is entitled to payment in the amount requested.
- 12.3.3. By submitting an application for payment, the Contractor warrants that: (i) the title to the Work covered by the estimate of Work completed will pass to the City by incorporation into the completed Work; (ii) the Work covered by previous estimates of Work completed is free and clear of liens, claims, security interests or encumbrances, except for any interest created by retainage; and (iii) no Work covered by the estimate of Work completed is subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or any other person or entity.
- 12.3.4. The Contractor shall not include in its application for payment any billing for defective Work or for work performed by Subcontractors or Suppliers if it does not intend to pay the Subcontractors or Suppliers for such work.
- 12.3.5. Applications may include the value of acceptable materials required in the construction which have been delivered on the site of the Work or to adjacent railway siding and for

which acceptable provisions have been made for preservation and storage, providing the Contractor submits with its monthly estimate paid invoices in duplicate for the material for which payment is being requested. Material paid for by the City becomes the property of the City and, in the event of the default on the part of the Contractor, the City may use or cause to be used such materials in construction of the Work provided for in the Contract.

- 12.3.6. The authorized City representative(s) must approve the applications and estimates before progress payments will be made. The City will make payments within thirty (30) days after that the receipt of a monthly estimate in proper form containing all required and requested information. Progress payments are payments on accounts and shall not be construed as acceptance by the City or any part of the Work.
- 12.3.7. All progress payments, except for the Final Payment, shall be subject to correction on subsequent applications after the discovery of any error. Approval of an application for payment of Work completed or actual payment by the City shall not foreclose the right of the City to examine the books and records of the Contractor to determine the correctness and accuracy of any item.
- 12.3.8. The Contractor shall make partial payments of the amount due and payable to each of its Subcontractors and Suppliers in the same manner as the City is required to pay the Contractor under this article. This provision shall not create any privity of contract between the City and any Subcontractor or Supplier, or make any Subcontractor or Supplier a third-party beneficiary of this Contract.

12.4. **Retainage & Withheld Amounts.**

- 12.4.1. The City will retain **five percent (5%)** of the total amount earned, including Change Orders, as indicated in each approved application until Final Payment. Securities are not acceptable to the City in lieu of retainage.
- 12.4.2. If the City finds that satisfactory progress is being made in all phases of the Contract, it may, upon written request by the Contractor, authorize payment from the withheld percentage. Before such payment is made, the City shall determine that satisfactory and substantial reasons exist for the payment and shall require written approval from any Surety furnishing the Payment Bond or Performance Bond.
- 12.4.3. The City may withhold, in addition to retained percentages from Contractor payments, such an amount or amounts from any progress payment or Final Payment as may be necessary to cover:
 - a) Claims for labor or materials furnished the Contractor or any Subcontractor or reasonable evidence indicating probable filing of such claims;
 - b) Failure of the Contractor to make proper payment to Subcontractors or Suppliers;
 - c) A reasonable doubt that the Contract can be completed for the balance then unpaid;
 - d) Evidence of damage to another contractor, utility, or private property;
 - e) Uncorrected defective Work or guarantees that have not been met;
 - f) Failure of the Contractor to submit cost breakdowns, schedules, reports and other information required under the Contract;

- g) Persistent failure to carry out the Work according to the Contract;
- h) Reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- i) Any tax delinquency, unpaid fee, or other unpaid financial obligation of the Contractor owed to the City;
- j) Any request that the City pay additional compensation to another contractor as a result of delays in the performance of that contractor's work caused by the Contractor's acts or omissions; and
- k) Any other amounts that the City is authorized to withhold under the Contract Documents.

If the reason for withholding is removed, the City will make payment of the withheld sums with the next regular progress payment unless another basis for withholding exists

- 12.4.4. Execution of the Contract by the Contractor shall constitute a waiver by the Contractor to claim any right of payment of interest upon any funds retained or withheld by the City pursuant to these General Conditions or C.R.S. § 38-26-107.

12.5. Substantial Completion.

- 12.5.1. When the Contractor considers the entire work ready for its intended use, the Contractor shall notify the Project Manager in writing that the entire Work is substantially complete, except for minor items specifically listed by Contractor as incomplete (the Contractor's punch list), and request that the Project Manager issue a Notice of Substantial Completion.

- 12.5.2. Within seven (7) days after the receipt of such notice, the Contractor, Project Manager and any other appropriate City representatives shall inspect the Work to determine the status of completion and the Contractor's punch list.

- a) If the Project Manager does not consider the Work substantially complete, the inspection will cease and the Project Manager will notify the Contractor in writing giving the reasons for denial of the Notice of Substantial Completion and the Contractor will proceed with the Work. All costs associated with such premature inspection, including any compensation for additional design services and the City's additional costs, shall be deducted from any payment due to the Contractor.
- b) If the Project Manager considers the Work substantially complete, the Project Manager will prepare and deliver to the contractor a Notice of Substantial Completion. The Project Manager shall attach to the notice a punch list of items to be completed or corrected before Final Acceptance. Failure to include any items on the punch list shall not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

12.6. Right of Early Occupancy or Use.

- 12.6.1. The City shall have the right to take early beneficial possession of and to use any completed or partially completed portions of the Work, even if Substantial Completion of the Work has not occurred and even if the Work has not been finally accepted. Such beneficial possession and early occupancy shall not constitute Substantial Completion of such portions of the Work nor affect the City's right to assess liquidated damages.

- 12.6.2. If the City elects to take possession of and to use any completed or partially completed portions of the Work prior to Substantial Completion, an inspection shall be made by the Contractor and the Project Manager. Based upon such inspection, the Project Manager will attempt to list all incomplete Work items observed, and shall provide the Contractor with such list. However, the absence of an item from the list shall not relieve the Contractor of responsibility to perform all of the Work. Any and all areas so occupied will be subject to a final inspection prior to Final Acceptance.
- 12.6.3. At the time of such inspection, the Parties shall also negotiate the responsibilities of the City and the Contractor for security, maintenance, heat, utilities, property insurance premiums, and damage to the Work. These negotiations are subject to the final approval of the City.
- 12.6.4. If the Contractor believes there will be an additional cost or delay associated with completion of the Work while the City occupies the Work in whole or in part under this section, the Contractor shall advise the Project Manager by Contractor Change Request of all such costs at or before the time of such inspection. If the Contractor fails or refuses to furnish such cost information, or fails or refuses to comply with the Contractor Change Request procedure, the Contractor shall be deemed to have waived any and all rights to assert any claim for such additional cost or delay.
- 12.6.5. If the City's need to occupy the Work prior to such time as the Work is complete is caused by the Contractor's failure to complete the Work within the stipulated Period of Performance, the Contractor shall bear any and all additional costs associated with completing the Work.

12.7. Final Acceptance.

- 12.7.1. When the Work specified in the Contract (including all punch list items) is completed and the final cleanup has been performed, the Contractor shall notify the Project Manager that all Work under the Contract has been completed and the Project Manager shall, within seven (7) days after such notice, make the final inspection.
- 12.7.2. If the Project Manager finds that the Project has been completed according to the Contract requirements and that all parts of the Work are in good condition and in working order, the City, upon the recommendation of the Project Manager, shall issue a Notice of Final Acceptance. Any Notice of Final Acceptance issued orally or without proper City authorization is void.
- 12.7.3. If the Project Manager finds that the Project has not been completed according to the Contract requirements and that not all parts of the Work are in good condition and in working order, the Project Manager shall compile a punch list of corrective or replacement Work to be completed by the Contractor and Contract obligations yet to be satisfied that the Contractor shall complete or fulfill to the Project Manager's satisfaction, at the Contractor's expense, as a condition precedent to the issuance of a Notice of Final Acceptance.

12.8. Final Settlement & Final Payment.

- 12.8.1. After Final Acceptance, the Project Manager, Contractor, or other person designated by the City, as appropriate, will prepare a final estimate of the total value of all Work performed under the Contract. This will include all extra Work properly authorized and performed. All prior estimates and payments shall be subject to correction in the final

estimate and payment. In the absence of error or fraud, all estimates, when approved by the City, shall be conclusive evidence of the Work performed and materials furnished.

- 12.8.2. The City shall not authorize final payment until all items on the punch list have been completed, a Notice of Final Acceptance is issued, and the Notice of Final Settlement has been published. If the Work is substantially completed, but Final Acceptance is prevented by the unavailability of materials, or other causes beyond the control of the Contractor, and if consistent with any applicable bond ordinance, the City, in its sole discretion, may release to the Contractor all amounts due except for a retainage of two (2) times the cost of completing the unfinished Work as estimated by the City.
- 12.8.3. Before the City will advertise final settlement, the Contractor shall demonstrate to the operating personnel of the City the proper operation and maintenance of all equipment and systems, and deliver to the Project Manager:
 - a) All guarantees and warranties;
 - b) Bound sets of required operations and maintenance manuals and instructions as required by the Contract Documents;
 - c) Record Documents as required by the Contract Documents;
 - d) Satisfactory evidence that all payroll, material bills, taxes, and other indebtedness connected with the Work have been paid or otherwise satisfied;
 - e) A complete and final, unconditional waiver or release of any and all lien and claim rights from each Subcontractor, materialman, Supplier, manufacturer, and dealer for all labor, equipment and material used or furnished by each on the Work;
 - f) Consent of the Surety to final payment;
 - g) All submittals required by the Contract Documents; and
 - h) Any other documents required to be furnished by the Contract Documents
- 12.8.4. The Work shall be advertised (Notice of Contractor's Settlement) in accordance with C.R.S. § 38-26-107. This statute governs the maintenance and enforcement of claims for payment against the Project by Subcontractors, Suppliers and certain others. Final payment and settlement shall be made only after the Contractor has completed the foregoing requirements, and the City is satisfied that no claims by Subcontractors or Suppliers have been filed or remain pending.
- 12.8.5. If any unpaid claim for labor, materials, rental machinery, tools, supplies, or equipment is filed prior to the date set for final settlement, the City shall withhold from payments to the Contractor sufficient funds to ensure the payment of such claim, until the same shall have been paid or withdrawn. Such payment or withdrawal shall be evidenced by filing with the Project Manager an unconditional receipt in full or an order for withdrawal signed by the claimant or its duly authorized agent or assignee. The City will withhold from payment any funds it may be required by law to withhold or that it may in the determination of the City be entitled to withhold, and final payment will not be made until, in the sole determination of the City, all conditions of the Contract and of law have been met.
- 12.8.6. If there are outstanding claims against the Contractor or its Subcontractors or for any other reason the Contractor is not able to fulfill one or more of the requirements of this section, the City may, at its sole discretion, waive the requirement, provided the Surety

agrees to the City making final settlement without in any way lessening or modifying the Surety's liability under such Bonds.

- 12.8.7. If any overpayment was made by the City at any time, the Contractor shall immediately return all overpaid amounts.
- 12.8.8. At the time of settlement, there shall be deducted from the final estimate (i) all previous payments made to the Contractor under the Contract, (ii) all amounts chargeable to the Contractor, (iii) all liquidated damages due the City; (iv) all unpaid taxes due and payable the City; and (v) all damages and all other costs, expenses and charges properly chargeable to the Contractor under the terms of the Contract.
- 12.8.9. Subject to delays allowed by Colorado law and these General Conditions, the City shall make Final Payment after Final Acceptance, including the release of all retainage and withheld amounts, except as authorized by the Contract Documents. Final Payment shall constitute complete payment for all Work, labor, materials, equipment, and miscellaneous items in the Project.
- 12.8.10. At the time of delivery to the Contractor of the final payment, the Contractor shall execute and give to the City a final receipt for the same.
- 12.8.11. The acceptance of final payment shall constitute a waiver of all Claims by the Contractor except those previously made in accordance with these General Conditions which have been separately identified by the Contractor as unsettled in the final payment application, and which the City agrees in writing may be set over for resolution after final payment.
- 12.8.12. All provisions of these Contract Documents, including without limitation those establishing obligations and procedures, shall remain in full force and effect notwithstanding the making or acceptance of final payment.

ARTICLE 13 DISPUTES & MEDIATION

13.1. If the Contractor considers any ruling or decision of the Project Manager to be unfair, the Contractor shall immediately ask for a written instruction or decision but shall perform the Work in conformance with the Project Manager's ruling. If the Contractor considers such instructions or decision unsatisfactory, the Contractor shall file a written claim or protest with the Project Manager.

13.2. Notice of Intent to Claim.

The Contractor shall submit a Notice of Intent to Claim for any claim, dispute, or protest ("Claim") of any decision or event arising out of or related to this Contract (other than those for which a specific procedure is set forth elsewhere in these General Conditions) in writing within ten (10) days of the later of the Contractor's receipt of the Project Manager's written instruction or decision (if applicable), deemed denial, or any other event giving rise to the claim, dispute, or other matter and shall include the basis for the Claim. The Notice of Intent to Claim shall be clearly titled as such, dated as of the actual date of submission, and numbered sequentially, and shall contain at a minimum:

- a) Project title and number;
- b) Date of the event giving rise to the claim, dispute, or protest;

- c) A description of the Claim and the events giving rise to the Claim, including any original request and the Project Manager's decision or denial; and
- d) The reasons why the Contractor believes additional compensation or time is due or charges were wrongly assessed;
- e) An accounting or estimate of all additional costs associated with the Claim;
- f) The Contractor's plan for mitigating costs or delays associated with the Claim.

13.3. Claim.

Within twenty (20) days after submitting the Notice of Intent to Claim, the Contractor shall submit to the Project Manager a complete and itemized Claim that includes any claimed increase in Contract Time or Contract Price, or both. The Contractor may request an extension of time to submit the Claim, which extension may be granted by the Project Manager, provided that good cause is shown. The Claim must be described in sufficient detail to allow the City to evaluate the basis of and costs associated with the Claim.

- 13.3.1. A Claim for an increase in Contract Price shall be submitted based on actual costs whenever possible, rather than an estimate or opinion, shall be supported by invoices, time cards, and other business records commonly accepted in the industry, and shall comply with the requirements of these General Conditions concerning changes to the Contract Price.
- 13.3.2. Any Claim for changes to the Contract Time shall include the information required by these General Conditions concerning changes to the Contract Time. The Claim shall be accompanied by copies of all Contract provisions or other documents supporting the Claim and a summary of the legal and factual theories supporting the Claim. A Claim for time extension must be accompanied by a revised Construction Schedule reflecting the effects of the delay on the completion of critical activities and showing actions that the Contractor has taken or proposes to take to minimize the effects of the delay.
- 13.3.3. The Claim shall also identify any measures the City can take to minimize the Claim.
- 13.3.4. The Contractor shall submit with its Claim a notarized certificate, executed under penalties of perjury, that:
 - a) The Claim is made in good faith;
 - b) All supporting data are accurate and complete to the best of the Contractor's knowledge and belief;
 - c) The amount requested accurately reflects that Contract adjustment for which the Contractor believes the City is liable; and
 - d) The prices stated for material and equipment are the lowest reasonably available to the Contractor and include all available discounts.
- 13.3.5. If the Contractor is an individual, the certification shall be executed by that individual; if the Contractor is not an individual, the certification shall be executed by an officer or general partner of the Contractor or other person having written authority to sign the Claim.

13.4. Additional Information.

The Contractor shall furnish, upon request, all additional information and data that the City

determines is needed to aid in resolving the Claim through negotiation or is required to complete an evaluation of the Claim. The Contractor shall give the City access to its books, correspondence, records, electronic files and data bases, and any other materials relating to the Claim, shall require its Subcontractors and Suppliers to provide the City with such access, and shall make its Personnel and that of its Subcontractors and Suppliers available to discuss and answer cost, schedule and other questions relating to the Claim. Clear copies of all necessary supporting records shall be provided to the City at no cost. Failure to submit requested information may be a basis for denial of the Claim.

13.5. Decision.

- 13.5.1. The City shall investigate, review, and evaluate the Claim and make a determination in writing within sixty (60) days of receipt of a completed and fully documented claim, unless special circumstances exist or the Claim is unusually complex, in which case the Contractor will be notified of any longer review period. If no determination is made within sixty (60) days, or by the end of any announced extended period of time, the claim is automatically denied.
- 13.5.2. The Contractor shall proceed diligently with performance of the Contract, pending final resolution of any Claim made under this article. Failure to proceed with the Work shall be grounds for suspension or termination of the Contract.
- 13.5.3. If the Contractor agrees with any determination or resolution by the City, such determination or resolution shall be processed as a Change Order

13.6. Waiver.

- 13.6.1. Failure to strictly meet any of the requirements of this article in a timely and complete manner shall constitute a waiver by the Contractor of any and all right to adjustments of Contract Time or Contract Price, either by administrative review or by any other action at law or equity.
- 13.6.2. Strict compliance with all provisions of this article shall be a condition precedent to the Contractor's ability to file any lawsuit in law or equity, or recover any damages, in connection any Claim.

13.7. Mediation.

- 13.7.1. If the Contractor disagrees with the City's determination of the Claim, the Parties shall first submit the dispute to non-binding mediation before seeking any remedy in any other forum. The mediator shall be a trained mediator having experience related to municipal construction projects. The Parties shall jointly select the mediator from a list of mediators proposed by the Parties. If the Parties are unable to agree on a mediator, the Parties shall submit three mediator names each and the mediator shall be selected by random drawing at which the Project Manager and the Contractor are present. No discussions or statements of the mediator may be admitted as evidence in any subsequent litigation, nor may the mediator be called to testify in any litigation. The cost of the mediator shall be shared equally by the Parties.
- 13.7.2. Mediation in accordance with this section shall be a condition precedent to filing any lawsuit relating to any Claim.

13.8. If any dispute, mediation, or litigation arises out of this Contract, the Contractor shall

continue the Work in accordance with the terms and conditions of the Contract Documents during the time such dispute, mediation, or litigation is pending except as expressly provided in the Contract Documents.

ARTICLE 14 BONDS

14.1. The Contractor shall, within the time specified in the Request for Bids, and before the commencement of any Work, provide the City with a separate:

14.1.1. Performance bond in an amount equal to 100% of the amount of the Contract Price as a guarantee of the Contractor's faithful performance and completion of all undertakings, covenants, terms, conditions, warranties, and agreements of the Contract; and

14.1.2. Payment bond in an amount equal to 100% of the amount of the Contract Price, which bond shall conform to the requirements of C.R.S. § 38-26-101, *et seq.*, as amended, as a guarantee of the Contractor's prompt payment to all persons supplying labor and materials in the prosecution of the Work provided by the Contract.

The Contractor shall use the Bond forms included with the Request for Bids. Other forms may be used if approved by the City Attorney before the submission of the bid.

14.2. The Contractor bears the expense of all Bonds.

14.3. The Contractor shall secure an increase in the bonds in an amount equal to the cost of any additional work authorized pursuant to a duly executed Change Order or Contract amendment that increases the Contract Price by ten percent (10%) or more, unless waived in writing by the Project Manager.

14.4. The Contractor and a Surety shall execute the Bonds. The Surety shall be corporate bonding company acceptable to the City, licensed to transact such business in the State of Colorado, and listed in the U.S. Department of the Treasury Circular 570 in effect on the date of the Request for Bids. Evidence of authority of an attorney-in-fact acting for the Surety shall be provided in the form of a certificate as to its power of attorney and to the effect that it is not terminated and remains in full force and effect on the rate of the Bonds.

14.5. If at any time a Surety on any Bond becomes irresponsible, is disqualified from doing business in the State of Colorado, or becomes insolvent or otherwise impaired, the Contractor shall furnish Bond(s) from an alternate Surety acceptable to the City.

14.6. The Bonds shall remain in effect until Final Acceptance.

ARTICLE 15 INSURANCE

15.1. General Requirements.

15.1.1. **Insurance Requirement.** The Contractor, at its own cost, shall procure and maintain, and shall cause each Subcontractor to procure and maintain, policies containing the minimum insurance coverage listed in this article for the duration of the Work. Such coverage shall be procured and maintained with forms and insurers acceptable to the City. All coverage shall be continuously maintained from the date of commencement of 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.

- 15.1.2. **No Modification of Liability.** 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. The insurance requirements contained in the Contract shall not limit or redefine the obligations of the Contractor as provided elsewhere in the Contract. The limits of any insurance required by this Agreement will not limit Contractor's liability.
- 15.1.3. **Evidence of Coverage.** Before commencing Work, the Contractor will provide certificates of insurance policies and all necessary endorsements evidencing insurance coverage required by the Contract Documents and identifying the Project. The City will not be obligated under the Contract until Contractor provides acceptable such certificates of insurance and endorsements. If the Term extends beyond the period of coverage for any required insurance, the Contractor will, at least ten (10) days before the expiration of any such insurance coverage, provide the City with new certificates of insurance and endorsements evidencing either new or continuing coverage.
- 15.1.4. **Breach.** Failure on the part of the Contractor to procure or maintain policies providing the required coverage, conditions, and minimum limits shall constitute a material breach of contract upon which the City at its discretion may procure or renew any such policy or any extended 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 City.

15.2. Required Policies.

- 15.2.1. **Commercial General Liability Insurance.** Comprehensive general liability insurance insuring against any liability for personal injury, bodily injury or death arising out of the performance of the Work with at least One Million Dollars (\$1,000,000) each occurrence and Two Million Dollars (\$2,000,000) general aggregate, including the following coverages: broad form property damage; operations premises liability; personal and advertising injury liability, independent contractors coverage, contractual liability, completed operations/products liability; coverage for construction, means, and methods; and explosion, collapse, and underground liability (if the Work requires blasting, explosive conditions, collapse hazards or underground operations, this coverage shall contain no exclusion relative to property in the care, custody, or control of the insured).
- 15.2.2. **Products and Completed Operations Insurance.** Products and completed operations insurance insuring against any liability for bodily injury or property damage caused by the completed Work, with a combined single limit of at least One Million Dollars (\$1,000,000) and Two Million Dollars (\$2,000,000) general aggregate.
- 15.2.3. **Builder's Risk.** A builder's risk or installation floater policy, at the City's discretion, in an amount equal to the value of the Project where the possibility exists of losses or damage to the Project. The Special Conditions of the Contract Documents will state if and when Builder's Risk is required.
- 15.2.4. **Comprehensive Automobile Liability Insurance.** Comprehensive automobile liability insurance insuring against any liability for personal injury, bodily injury or death arising out of the use of motor vehicles and covering operations on or off the site of all motor vehicles controlled by Contractor that are used in connection with performance of the

Work, whether the motor vehicles are owned, non-owned, hired, leased, or borrowed, with a combined single limit of at least Two Million Dollars (\$2,000,000) each accident and personal injury protection per Colorado law.

- 15.2.5. **Other Insurance.** Workers' compensation insurance (unless Contractor provides a completed Declaration of Independent Contractor Status Form) and other insurance required by applicable law.

15.3. Terms of Insurance.

- 15.3.1. **Additional Insured.** Except for the workers' compensation policy, all required insurance policies shall name the City and any additional person or entity identified by the City as an additional insured and will provide that the City or other additional insured, although named as an additional insured, will nevertheless be entitled to recovery under said policies for any loss occasioned to the City or its officers, employees or agents or other additional insured by reason of the negligence of Contractor or its officers, employees, agents, subcontractors or business invitees. The insurance policies will be for the mutual and joint benefit and protection of the Contractor and the City and other additional insured, if any. Such policies will be written as primary policies not contributing to and not in excess of coverages the City or other additional insured may carry.
- 15.3.2. **Qualification; Deductible.** Insurance required by this Section will be with companies qualified to do business in the State of Colorado and having an AM Best Rating of not less than B+ and/or VII. Insurance may provide for deductible amounts as the Contractor deems reasonable for the Services, but in no event greater than Twenty Thousand Dollars (\$20,000.00) (unless waived by the City), and the Contractor will be responsible for the payment of any such deductible.
- 15.3.3. **Cancellation.** The policies shall not be cancelled, terminated or materially changed until at least 30 days prior written notice has been given to the City.
- 15.3.4. **Coverage Type.** Contractor will identify whether the type of coverage is "occurrence" or "claims made." If the type of coverage is "claims made," which at renewal Contractor changes to "occurrence," the Contractor will carry a twelve (12) month tail. The Contractor will not do or permit to be done anything that will invalidate the policies.
- 15.3.5. **No "Pollution Exclusion."** The required insurance will cover any and all damages, claims or suits arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of pollutants, and will not exclude from coverage any liability or expense arising out of or related to any form of pollution, whether intentional or otherwise. If the Contractor is unable to procure a policy of insurance in compliance with these provisions, the Contractor will secure and maintain either a rider or a separate policy insuring against liability for pollution related damages, claims or suits, as described in subsection ii(a), with at least Two Million Dollars (\$2,000,000) each occurrence, subject to approval by the City.

ARTICLE 16 INDEMNIFICATION

- 16.1. The Contractor shall indemnify, save harmless, and defend the City, its officers and employees, from and in all suits, actions or claims of any character brought because of: any injuries or damage received or sustained by any person, persons or property because of operations for the City under the Contract; the Contractor's failure to comply with the provisions of the Contract; the Contractor's neglect of materials while constructing the Work; because of any act or omission, neglect or misconduct of the Contractor; because of any claims or amounts recovered from any infringements of patent, trademark, or copyright, unless the design, device, materials or process involved are specifically required by Contract; from any claims or amount arising or recovered under the "Workers' Compensation Act," by reason of the Contractor's failure to comply with the act; pollution or environmental liability; or any failure of the Contractor to comply with any other law, ordinance, order or decree. Nothing in this article requires the Contractor to defend, indemnify, or hold harmless the City from the City's own negligence.
- 16.2. The Contractor will include this article in all Subcontracts.
- 16.3. The City may retain so much of the money due the Contractor under the Contract as the City considers necessary to offset any damages for which Contractor may be liable under this paragraph. If no money is due, the Contractor's Surety may be held until such suits, actions, claims for injuries or damages have been settled. Money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that it and the City are adequately protected by public liability and property damage insurance.
- 16.4. The Contractor will pay the City all expenses incurred to enforce this article. If the insurer of the Contractor fails to provide or pay for the defense of the City of Commerce City, its officers and employees, as additional insured, the Contractor agrees to pay for the cost of that defense.
- 16.5. This article will survive Final Acceptance and the termination of this Contract.

ARTICLE 17 CONTRACT TERMINATION

17.1. Termination for Cause.

- 17.1.1. The City may terminate the Contract for cause due to the actions or inactions of the Contractor. Cause includes, without limitation:
- a) If the Work to be performed under the Contract is assigned by the Contractor without written permission of the City;
 - b) If the Contractor shall file a voluntary petition in bankruptcy;
 - c) If a general assignment of the Contractor's assets is to be made for the benefit of its creditors;
 - d) If a receiver is appointed for the Contractor or any of its property;
 - e) If the Contractor has materially breached any of the conditions, provisions or covenants of the Contract;
 - f) If, at any time, the performance of the Work under the Contract is being unnecessarily delayed or if the Contractor is willfully or deliberately violating any of the conditions, provisions, or covenants of the Contract Documents, or if the Contractor is executing the same in bad faith or otherwise not in accordance with

terms of the Contract;

- g) If the Work or any part of the Work is not fully completed within the time or times named for its completion or within the time to which such completion date or dates have been extended;
- h) If the Contractor abandons the Work;
- i) If the Contractor fails to maintain the required Bonds, licenses, permits, or insurance;
- j) If the Contractor or any of its officers or employees are convicted, plead nolo contendere, enter into a formal agreement in which they admit guilt, enter a plea of guilty, or otherwise admit culpability to criminal offenses of bribery, kickbacks, collusive bidding, bid-rigging, antitrust, fraud, undue influence, theft, racketeering, extortion or any offense of a similar nature, in connection with Contractor's business; or
- k) If other just cause exists.

17.1.2. The City will send written notice to the Contractor and the Surety of the City's intent to terminate for cause and will give the Contractor and Surety ten (10) days from the date the notice was sent to cure the default or provide to the City in writing, a detailed plan of how it will remove the causes for termination, except that, if the Completion Date is less than ten (10) days away, the notice may specify less than ten (10) days. If the Contractor or Surety does not submit such plan within the time established, or if, in the judgment of the City, such plan will not ensure the satisfactory performance of the Work, the City may declare the Contract terminated on the effective date specified in the notice or any other date thereafter.

17.1.3. In the event of termination for cause, the City shall notify the Contractor to discontinue all Work under the Contract and the Contractor shall immediately respect such notice, stop all Work and cease to have any right to possession of the Work site.

17.1.4. In addition, the Contractor shall forfeit its Contract as of the specified effective date of termination.

17.1.5. Upon such termination for cause, the City may take possession of all materials, equipment, tools, and plant as may be on the site of the Work or necessary for completion of the Work and take over the Work and prosecute the same to completion, by Contract or otherwise, for the account and at the expense of the Contractor.

17.1.6. The Contractor and the Surety shall be liable to the City for any and all costs and expenses in excess of the Contract Price or prices sustained by the City by reason of such prosecution and completion, which costs shall include all administrative costs.

17.2. Termination for Convenience.

17.2.1. The performance of Work under the Contract in whole or in part may be terminated without cause by the City whenever the City, in its sole discretion, shall determine that such termination is in the best interest and convenience of the City or whenever the City is prohibited from completing the Work for any reason. Such termination shall be effected by giving not less than three (3) days' written notice to the Contractor specifying the extent to which performance of the Work is terminated and the date upon which such termination becomes effective.

17.2.2. Upon receipt of such notice of termination, the Contractor shall:

- a) Stop work as specified in the notice;

- b) Terminate all orders and subcontracts except as necessary to complete Work which is not terminated;
 - c) If directed in writing by the City to do so, assign all right, title, and interest in subcontracts and materials in progress, in which case the City will have the right, in its discretion, to settle or pay any or all Claims arising out of the termination of such subcontracts;
 - d) Settle outstanding liabilities and claims with the approval of the City;
 - e) Complete performance of such part of the Work not terminated; and
 - f) Take such other actions as may be necessary, or as may be directed by the City, for the protection and preservation of the property related to the Contract.
- 17.2.3. Except as provided herein, any inventory paid for by the City but remaining upon the termination of the Contract may, with written approval of the City, be sold or acquired by the Contractor under the conditions prescribed by and at prices approved by the City.
- 17.2.4. Upon receipt of notice of such termination, the Contractor shall submit to the Project Manager a request for final payment, in a form and with certification prescribed by the City. Such request shall be submitted promptly but in no event later than sixty (60) days from the effective date of termination, unless extended in writing by the Project Manager, upon the written request of the Contractor within such sixty (60) day period.
- 17.2.5. The final payment to the Contractor after a termination for convenience shall be calculated as follows:
- a) From the Contract Price, subtract the following:
 - 1) The total amount paid to the Contractor to date;
 - 2) The value of the Work completed since the last approved pay application;
 - 3) The total amount of retainage withheld by the City to date;
 - 4) The agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired or sold by the Contractor or sold pursuant to these General Conditions and not otherwise recovered by or credited to the City;
 - 5) The total of all claims the City may have against the Contractor; and
 - 6) Any outstanding claims pursuant to C.R.S. § 38-26-107, as amended or superseded.
 - b) Multiply the number resulting by 0.05. The number resulting is the full and complete compensation for anticipated profits
 - c) Add the following to the total resulting from the prior step:
 - 1) Any actual costs incurred by the Contractor for restocking charges;
 - 2) The agreed upon price of protecting the Work in the manner, if any, directed by the City;
 - 3) The amount of retainage withheld by the City to date; and
 - 4) The value of the Work completed since the last approved pay application.
- 17.3. The sum calculated under this article, when paid to the Contractor, shall constitute full and final settlement of the Contract Price.

- 17.4. The City may, from time to time, under such terms and conditions as the City may prescribe, authorize partial payments and payments against costs incurred by the Contractor for the terminated portion of the Contract, if it is estimated that the total of such payments will not exceed the amount to which the Contractor will be entitled. If the total of such payments is in excess of the amount to which the Contractor is entitled, the excess shall be payable by the Contractor to the City upon demand, together with interest computed pursuant to statute, for the period from the date the excess payment is received by the Contractor to the date the excess is repaid to the City.
- 17.5. The settlement for the Work performed shall not relieve the Contractor or its surety from responsibility for defective Work and/or materials on the completed portion of the Work nor for labor and materials or any other items as guaranteed by the Bonds.
- 17.6. The City shall be given full access to all books, correspondence, records, electronic files and data bases, and other materials of the Contractor relating to the Contract in order to determine the amounts to be paid on account of the termination of the Contract under this article. The Contractor shall furnish clear copies of any such materials as requested by the City.
- 17.7. If the Parties fail to agree in whole or in part on the amount or amounts to be paid to the Contractor in connection with the termination of work pursuant to this article, the Contractor may submit a claim as provided in these General Conditions, except that, if the Contractor has failed to submit its request for payment within the time provided above and has failed to request an extension of such time, it shall have no such right.

ARTICLE 18 AUDIT

18.1. Records and Reports.

18.1.1. The Contractor shall keep and maintain and shall cause its Subcontractors, Suppliers and outside consultants to keep and maintain books, records, accounts and other documents ("records") that are sufficient to accurately and completely reflect all costs incurred pursuant to the Contract that may be the basis of a Contractor Change Request or a claim by the Contractor. Such records may include the bid estimate, receipts, memoranda, vouchers, and accounts of every kind and nature pertaining to the performance of the Work including but not limited to job cost ledgers, invoices from and payments to Subcontractors, Suppliers and materialmen, and records of home and field office overhead, as well as complete summaries and reports setting forth all reimbursable man hours expended and payroll records.

18.1.2. All such records shall be maintained a period of three (3) years from the date of Final Payment under the Contract in which the Work is completed. All Subcontractors shall keep and preserve such records accounts for a period of three (3) years from the date of Final Payment under the subcontract.

18.2. **Access.** The Contractor shall permit the City and the its auditors to have access to such records and any information or areas as provided in these General Conditions for the purpose of making such financial audits, or verifications as the City deems necessary or appropriate concerning the Contractor's performance under the Contract. Access will be provided at the Contractor's regular place of business in Colorado at reasonable times and upon reasonable notice.

ARTICLE 19 SALES AND USE TAX

Unless specifically exempt, all equipment used and all materials provided or consumed in or for construction and services performed within the City are taxable, including construction and services performed on behalf of an exempt institution or governmental, religious, charitable, private or any other type of owner, including the City.

- 19.1. **Contractor Responsible for Tax.** The Contractor is subject to the tax on all purchases, fabrication, manufacture or other production of tangible personal property used, stored or consumed on such construction and services, including parking lots, roads, bridges, highways, building construction and remodeling of both public and private facilities.
- 19.2. **Specific Industry Standard.** The Specific Industry Standard for Construction and Contractors (Regulation 20-S.I.15) can be provided upon request by contacting the City's Finance Department, Sales Tax Division, at 303-289-3628, and is available on the City's website at <http://www.c3gov.com/DocumentView.aspx?DID=115>.
- 19.3. **Equipment.** Prior to or on the date the Contractor locates equipment within the City to fulfill this Work, the Contractor shall file a declaration describing each anticipated piece of equipment the purchase price of which was two thousand five hundred dollars (\$2,500) or greater, stating the dates on which the Contractor anticipates the equipment to be located within and removed from the boundaries of the City and stating the actual or anticipated purchase price of each such anticipated piece of equipment along with any other information deemed necessary by the City. When such declared equipment is located within the City for a period of thirty (30) days or less, the Contractor may include sales and use tax calculated on one-twelfth (1/12) of the purchase price of such equipment in the contract amount, in compliance with Section 20-5-T of the Commerce City Sales & Use Tax Code. If the Contractor fails to declare the equipment to the City prior to or on the date the Contractor locates the equipment within the City, none of the sales and use tax due on the equipment shall be allowed as a contract expense.

ARTICLE 20 PERSONNEL & CIVIL RIGHTS

- 20.1. **Colorado Labor (C.R.S. § 8-17-101).** At least eighty percent (80%) of each type or class of labor employed by the Contractor and any Subcontractors to perform the Work shall be persons who, at time of employment, are residents of the State of Colorado, without discrimination as to race, color, creed, gender or sex, age, religion, national origin, veteran's status or religion, except when minimum age is a bona fide occupational qualification. The Project Manager, if requested in writing by the Contractor and approved by the Project Manager in writing, may waive this requirement.
- 20.2. **Anti-Discrimination.** While engaged in the performance of the Work, Contractor shall maintain employment practices consistent with the Colorado Antidiscrimination Act, C.R.S. § 24-34-301 through § 24-34-804, as amended.
- 20.3. **Civil Rights.**

In compliance with the Civil Rights Act of 1964, coupled with the Colorado Governor's Executive Order dated July 6, 1972, Contractor, for itself and its assignees and successors in interest, agree as follows:

- 20.3.1. When applicable, the Contractor shall comply with the Regulations of the Department of Transportation relative to nondiscrimination in Federally assisted programs of the

Department of Transportation (Title 49, Code of Federal Regulations, Part 21, hereinafter referred to as the "Regulations"), which are herein incorporated by reference and made a part of this Contract. Contractor shall not participate either directly or indirectly in discrimination prohibited by Section 21.5 of the Regulations including employment practices when the Contract covers a program set forth in Appendix "C" of the Regulations.

- 20.3.2. The Contractor, with regard to the Work performed by it after award and prior to completion of the Work, shall not discriminate on the grounds of race, creed, color, gender or sex, age, religion, veteran status, national origin or ancestry in the selection and retention of Subcontractors, including procurements of materials and leases of equipment.
- 20.3.3. In all solicitations either by competitive bidding or negotiation made by Contractor for work to be performed under a subcontract, including procurements of materials or equipment, each potential Subcontractor or Supplier shall be notified by Contractor of Contractor's obligations under this Contract and the regulations related to nondiscrimination on the grounds of race, creed, color, gender or sex, age, religion, veteran status, national origin or ancestry.
- 20.3.4. The Contractor shall take all affirmative actions necessary and appropriate to implement, not only the letter but also the spirit, of the policy of equality of opportunity as enunciated in the Constitution and the laws of the State of Colorado and as construed by the courts to prevent discrimination because of race, creed, color, gender or sex, age, religion, handicap, veterans status, national origin or ancestry.
- 20.3.5. The Contractor shall include the provisions of these subsections 1 through 5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, orders or instructions issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as the City may direct as a means of enforcing such provisions; provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or supplier as a result of such direction, the Contractor may request the City to enter into such litigation to protect the interest(s) of the City.

20.4. **Americans with Disabilities Act.**

The City makes every attempt to comply with the Americans with Disabilities Act and requires all contractors to be aware of this law and to report immediately to the Project Manager any requests or complaints based upon the Americans with Disabilities Act. This requirement applies to persons or groups who have identified themselves as disabled, or as someone with whom they associate as disabled, and who require a special accommodation.

20.5. **Illegal Aliens & Public Contracts (C.R.S. § 8-17.5-38).**

- 20.5.1. **Certification.** The Contractor certifies that, as of the Effective Date, it does not knowingly employ or contract with an illegal alien who will perform work under this Contract and that the Contractor will participate in the E-verify Program or Department Program as defined in C.R.S. § 8-17.5-37 in order to confirm the eligibility of all employees who are newly hired to perform work under this Contract.

- 20.5.2. **Pre-Employment Screening.** The Contractor is prohibited from using either the E-

verify Program or Department Program procedures to undertake pre-employment screening of job applicants while this Contract is being performed.

20.5.3. **Contractor Obligations.** The Contractor will not knowingly employ or contract with an illegal alien to perform work under this Contract or contract with a Subcontractor that fails to certify to the Contractor that the Subcontractor will not knowingly employ or contract with an illegal alien to perform work under this Contract. If the Contractor obtains actual knowledge that a Subcontractor performing work under this Contract knowingly employs or contracts with an illegal alien, the Contractor will:

- a) Notify the Subcontractor and the City within three (3) days that the Contractor has actual knowledge that the subcontractor is employing or contracting with an illegal alien; and
- b) Terminate the subcontract with the Subcontractor if within three (3) days of receiving the notice required pursuant to this subparagraph d the Subcontractor does not stop employing or contracting with the illegal alien; provided, however, that the Contractor will not terminate the contract with the Subcontractor if during such three (3) days the Subcontractor provides information to establish that the Subcontractor has not knowingly employed or contracted with an illegal alien.

20.5.4. **Compliance with Investigation.** The Contractor will comply with any reasonable request by the Colorado Department of Labor and Employment made in the course of an investigation undertaken pursuant to Article 17.5 of Title 8, C.R.S.

20.5.5. **Violation.** If the Contractor violates this Section, the City may terminate this Contract for breach of contract and the Contractor will be liable for actual and consequential damages to the City.

20.6. **Verification of Lawful Presence (C.R.S. § 24-76.5-103).**

20.6.1. If the Contractor is a natural person, including a sole proprietor with or without employees (i.e., not a corporation, limited liability company, partnership or similar entity), and is 18 years of age or older, the Contractor must: (a) complete an affidavit containing the information required by C.R.S. § 24-76.5-103(4)(b); and (b) attach a photocopy of the front and back of a valid form of identification as required by C.R.S. § 24-76.5-103(4)(a).

20.6.2. If the Contractor executes the affidavit stating that he/she is an alien lawfully present in the United States, the City will verify his/her lawful presence through the federal systematic alien verification or entitlement program, known as the "SAVE Program," operated by the U.S. Department of Homeland Security ("DHS") or a successor program designated by DHS. If the City determines through the verification process that the Contractor is an alien not lawfully present in the United States, the City will terminate this Agreement without further obligation to Contractor.

ARTICLE 21 MISCELLANEOUS

21.1 **Federal Aid Provisions.** When the United States of America, acting through any of its duly constituted departments or agencies, provides funds to pay for any portion of the costs of Work performed under the Contract, the provisions of the Constitution, Laws of the United States and the rules and regulations promulgated by the department or agency thereof, pertaining to the utilization of such funds, shall be incorporated by reference as a part of the terms and conditions of the Contract and shall be observed by the Contractor.

When the United States of America is involved as a result of providing funds to support the Work of the Contract, it may assign observers or inspectors as it deems necessary to ensure that purposes for which the funds were provided are achieved. However, such activity by the United States does not make it a party to the Contract and shall not interfere with the rights of either the City or the Contractor.

- 21.2 **Duties & Remedies.** The duties and obligations imposed by, and rights and remedies available under, the Contract Documents shall be in addition to, and shall not be in any way construed to be a limitation of, any duties, obligations, rights, and remedies imposed by or available by law or contract.
- 21.3 **Survival.** All representations, warranties, and guarantees made in the Contract Documents shall survive Final Payment, Final Acceptance, and termination of the Contract for any reason.
- 21.4 **Government Immunity.** The City is relying on, and does not waive or intend to waive by any provision of this Contract, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, §24-10-37, *et seq.*, 10 C.R.S., as from time to time amended, or otherwise available to City, its officers, or its employees.
- 21.5 **Colorado Open Records Act.** The City is a public entity subject to the Colorado Open Records Act, C.R.S. § 24-72-201, *et seq.*, and all Contract Documents and any documents or reports produced pursuant to this Contract, may be subject to public disclosure.
- 21.6 **Construction.** The provisions of the Contract shall be construed as to the ordinary meaning of the words used so as to fairly accomplish the purposes and intentions of all Parties, and not for or against any party based upon any attributes to such party of the source of the language in question. No term of this Agreement will be construed or resolved in favor of or against the City or Contractor on the basis of which party drafted the uncertain or ambiguous language. Where appropriate, the singular includes the plural and neutral words and words of any gender will include the neutral and other gender. All headings, captions and titles are for convenience and reference only and of no meaning in the interpretation or effect of the Contract.
- 21.7 **No Implied Representations.** No representations, agreements, covenant, warranties, or certifications, express or implied, exist as between the Parties, except as specifically set forth in the Contract.
- 21.8 **Financial Obligations of City.** All financial obligations of the City under the Contract are contingent upon appropriation, budgeting, and availability of specific funds to discharge such obligations. Nothing in the Contract shall be deemed a pledge of the City's credit, or a payment guarantee by the City to the Contractor.
- 21.9 **Assignment/Transference.** The Contractor may not assign or transfer any interest in the Contract, including any money due or to become due, without the express prior written consent of the City.
- 21.10 **Amendments.** The Parties shall only amend the Contract in writing with the proper official signatures and, if required elsewhere in this Contract, on the proper forms.
- 21.11 **Waiver.** The waiver of any breach of a term, provision or requirement of this Contract, including the failure to insist on strict compliance or to enforce any right or remedy, shall

not be construed or deemed as a waiver of: any subsequent breach of such term, provision or requirement or of any other term, provision or requirement; any right to insist on strict compliance with any term, provision or requirement; or any right to enforce any right or remedy with respect to that breach or any other prior, contemporaneous, or subsequent breach.

- 21.12 **No Third-Party Beneficiaries.** The enforcement of the terms and conditions of the Contract and all rights of action relating to such enforcement shall be strictly reserved to the Parties. The Parties expressly intend that any person other than the City and the Contractor shall be deemed to be only an incidental beneficiary under this Agreement.
- 21.13 **Independent Contractor – No Partnership or Agency.** Notwithstanding any language in the Contract Documents or any representation or warranty to the contrary, the relationship between the Contractor and the City shall be as independent contractors, and neither the City nor the Contractor shall be deemed or constitute an employee, servant, agent, partner or joint venturer of the other. The Contractor is obligated to pay federal and state income tax on any money earned pursuant to this Contract, and neither the Contractor nor its employees, agents, or representatives are entitled to workers' compensation benefits unemployment compensation benefits, sick and annual leave benefits, medical insurance, life insurance, or pension or retirement benefits from the City.
- 21.14 **Governing Law; Jurisdiction; Venue.** The Contract is governed and to be construed according to the laws of the State of Colorado without regard to its conflicts of laws provisions. For all claims arising out of or related to this Contract, the Contractor consents to the jurisdiction of and exclusive venue in the state courts in the County of Adams, State of Colorado. Contractor waives any exception to jurisdiction because of residence, including any right of removal based on diversity of citizenship.
- 21.15 **Attorney's Fees & Costs.** The prevailing party in any litigation to resolve a dispute between the Parties arising from this Contract will be entitled to recover court costs and reasonable attorney fees from the non-prevailing party.
- 21.16 **Binding Contract.** The Contract is binding upon the Parties and their respective heirs, executors, administrators, successors, and assigns.

ATTACHMENT F

**SPECIAL CONDITIONS
PROJECT NAME: Monaco Park Renovation
PROJECT NO.: PRG-02-2023**

1. Liquidated Damages.

Liquidated damages assessed in accordance with the Contract Documents shall be at the rate of **\$500** per day.

2. Measurement.

Measurement of pay items subject to Unit Prices shall be on a percentage complete basis.

3. Licenses.

In addition to any licenses and permits required by law, the Contractor and any Subcontractor (if applicable to that Subcontractor's performance of Work)

Holidays.

Holidays recognized by the City of Commerce City are:

- | | |
|---------------------|------------------------|
| • September 4, 2023 | Labor Day |
| • November 10, 2023 | Veteran's Day |
| • November 23, 2023 | Thanksgiving Day |
| • November 24, 2023 | Day After Thanksgiving |
| • December 25, 2023 | Christmas Day |
| • January 1, 2024 | New Year's Day |
| • January 15, 2024 | Martin Luther King Day |
| • February 19, 2024 | President's Day |
| • May 27, 2024 | Memorial Day |
| • July 4, 2024 | Independence Day |

When New Year's Day, Independence Day, or Christmas Day falls on a Sunday, the following Monday shall be considered a holiday. When one of these days falls on a Saturday, the preceding Friday shall be considered a holiday.



Department of Parks, Recreation & Golf

6060 Parkway Avenue
Commerce City, Colorado 80022
303-289-8166

MONACO PARK RENOVATION

Project: PRG-2023-01

Contract

Book Number: _____

June 2023

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PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: This section includes general description of the Work with limitations or coordination with other contracts, if any.
- 1.3 GENERAL:
- A. The Work to be done under this Contract is the construction of the Work as shown, documented, and set forth in the Contract Documents, in a workmanlike manner, to the satisfaction of the Construction Manager.
 - B. If these documents or job conditions make it impossible to produce first class work or to warranty the work or the Contractor's performance, or should discrepancies appear among the Contract Documents, the Contractor must immediately request interpretation, correction or clarification.
 - C. Should a conflict occur in or between Drawings and Specifications, Contractor is deemed to have estimated on the more expensive way of doing work unless he shall have asked for and obtained written decision before submission of Bid as to which method or materials will be required.
 - D. The Contractor represents that he fully understands the nature and extent of the Work, all factors and conditions affecting or which may be affected by it and characteristics of its various parts and elements and their fitting together and functioning.
- 1.4 PROJECT DESCRIPTION:
The work to be performed generally includes the following: site grading, concrete trails, shade shelters, playground, prefabricated restroom, landscaping, irrigation, asphalt parking lot paving, lighting and site furniture.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01010

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to Work of this section.

1.2 SUMMARY:

A. Section Includes: Requirements for coordination, supervision and administration for the Work, including but not necessarily limited to:

Coordination
Administrative and supervisory personnel
General installation provisions
Cleaning and protection
Utilities and site work

B. Related Sections:

Description of the Work: Section 01010
Administration, Procedures, Codes: Section 01105
Project Meetings: Section 01200

1.3 GENERAL COORDINATION:

A. General:

1. The Contractor shall ensure that each entity involved in the performance of the Work shall cooperate in the overall coordination of the Work; promptly, when requested by the Contractor, furnish information concerning the entity's portion of the Work; and respond promptly and reasonably to the decisions and requests of persons designated with coordination, supervisory, administrative, or similar authority.
2. The Contractor shall, where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
3. Prepare similar memoranda for the Owner's Representative and separate Contractors where coordination of their work is required.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction work. Such administrative activities include, but are not limited to, the following:

Preparation of schedules
Installation and removal of temporary facilities
Delivery and processing of submittals
Progress meetings
Project close-out activities

- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water and materials. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as the Owner's Representative's property.
 - D. Site Utilization: In addition to the site utilization limitations and requirements shown on the Drawings and indicated by the Contract Documents, administer the allocation of available space equitably among entities needing access and space, so as to produce the best overall efficiency in the performance of the Work. Schedule deliveries so as to minimize the space and time requirements for storage of materials and equipment on the site; but do not unduly risk delays in the Work.
 - E. Coordination Meetings: Include in scheduled meetings, coordination of various entities and activities as set forth in Section 01200. Where necessary, schedule additional coordination meetings for this purpose on an as needed basis.
 - F. Layout: It is recognized that the Contract Documents are diagrammatic in showing certain physical relationships of the various elements and systems and their interfacing with other elements and systems. Establishment and coordination of these relationships is the exclusive responsibility of the Contractor. Do not scale the Drawings. Lay out and arrange all elements to contribute to safety, efficiency and to carry the harmony of design throughout the Work. In case of conflict or undimensioned locations, verify required positioning with the Construction Manager. The Contractor shall provide surveying for the layout of all improvements including both horizontal and vertical control.
 - G. Substrate Examination: The Contractor shall ensure that the subcontractor of each element of the Work examines the conditions of the substrate to receive the work, dimensions and spaces adjacent, tolerances, interfacing with other elements and services, and the conditions under which the Work will be performed. The Contractor shall require each subcontractor to notify the Contractor in writing of conditions detrimental to the proper or timely completion of the Work, and ensure that they do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the subcontractor.
- 1.4 COMPLETE SYSTEMS: It is the intent of the Contract Documents that the system be complete and functional to provide the intended or specified performance. The Contractor shall provide all incidental items and parts necessary to achieve this requirement.
- 1.5 COMPATIBILITY: Provide products and equipment which are compatible with other work requiring mechanical interface including connections, control devices, water, drain and other piping connections. Verify requirements and other interface requirements before ordering equipment and resolve conflicts that may arise.

PART 2 - PRODUCTS (Not applicable)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROCEDURES:

- A. Require the subcontractor of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items. Re-check measurements and dimensions before starting each installation.
- C. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- D. Installation:
 - 1. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
 - 2. Install each component during weather conditions and the Work status that will ensure the best possible results. Isolate each part of the completed construction from incompatible materials as necessary to prevent deterioration.
 - 3. Coordinate work with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Construction Manager for final decision.
- F. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Construction Manager for final decision.

3.2 CLEANING AND PROTECTION:

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration prior to achieving substantial completion.

- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

END OF SECTION 01040

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to work of this section.
- 1.2 DESCRIPTION: Section includes general requirements and procedures for construction surveying.
- 1.3 RELATED SECTIONS:
 - A. Traffic control – Section 01500
 - B. Earthwork and vertical control – Section 02200
 - C. Layout of concrete items and horizontal control – Section 02520
 - D. Layout of site improvements – see affected Division 2 sections.
- 1.4 EXISTING UTILITIES:
 - A. The existence and location of underground utilities and construction indicated as existing are not guaranteed.
 - B. Before starting any work disturbing, moving or penetrating the ground, the Contractor must have all existing utilities located, staked, and depth identified by the appropriate entity.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION**

- 3.1 CONSTRUCTION SURVEYING:
 - A. General: The work shall consist of the construction surveying, calculating, and staking necessary for the construction of all elements of the project. Layout of site elements will be accomplished either by means of coordinates or traditional baseline method or a combination of both.
 - B. The work shall be done under the supervision of a Professional Engineer (P.E.) or Professional Land Surveyor (P.L.S.) who is experienced and competent in site construction surveying and registered in the State of Colorado. Referencing, setting and restoring land monuments and the determination of property lines shall be done in accordance with Section 629 of the CDOT specifications. The P.E. or P.L.S. shall be available to review work, resolve problems and make decisions in a timely manner.

- C. The Contractor shall furnish all personnel, materials and traffic control necessary to perform the required construction surveying. All surveying equipment, including Electronic Distance Meters, tapes, tribrachs, theodolites, total stations, GPS receivers and levels shall be calibrated prior to the start of work. EDM's, total stations, and GPS receivers shall be checked on a National Oceanic and Atmospheric Administration (NOAA) calibrated baseline. Equipment calibration accuracy and adjustments made to meet requirements specified in the Colorado Department of Transportation (CDOT) Survey Manual shall be documented in the Survey Records.
- D. Contractor shall establish horizontal and vertical control for the project. A Pre-survey Conference shall be held prior to performing any surveying work. The Construction Manager, Contractor's Superintendent, and Contractor's Surveyor (P.E. or P.L.S.) shall attend. A surveying work schedule shall be submitted to the Construction Manager for review prior to the conference.
- E. Contractor shall check all Owner's Representative's-established control points, and verify and document their accuracy, prior to using them for construction surveying control.
- F. Contractor shall perform all construction surveying and staking that is necessary for construction of the project.
 - 1. The Contractor shall pay the cost of all construction surveying for line and grade.
 - 2. Working from lines and levels established by the property survey, establish and maintain benchmarks and other dependable markers to set the lines and levels for the work and elsewhere on the site as needed to properly locate every element of the Work.
 - 3. As construction proceeds, check every major element for line, level and plumb.
 - 4. Calculate and measure required dimensions as shown within recognized tolerances. Do not scale the Drawings to determine dimensions. Advise entities engaged in construction activities of the marked lines and levels provided for use.
 - 5. The Contractor is to establish all necessary benchmarks on site for layout and grading based on the control points shown on the plans.
- G. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility line gradients and invert elevations by instrumentation and similar appropriate means.
- H. Layout Procedures:
 - 1. Verify layout information shown on the Drawings in relation to the property survey and existing benchmarks, before proceeding with the layout of the actual work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 2. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or

- requirements to relocate reference points because of necessary changes in grades or locations.
3. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.
 4. Establish and maintain a minimum of two temporary benchmarks on the site, reference to data established by survey control points.
- I. Staking: Acceptable staking placement intervals for the various construction survey control operations shall be approved by the Construction Manager prior to the beginning of work. Stationing shall be established in the field on centerline or an approved offset.
 - J. Accuracy and Tolerances: Accuracy of surveys and survey tolerances shall be as specified in the Contract or the CDOT Survey Manual. If a discrepancy should occur, the higher degree of accuracy or the more restrictive tolerance shall apply.
 - K. Responsibility and Inspection: Supervision and coordination of construction surveying is the Contractor's responsibility. The Construction Manager may inspect the Contractor's surveying; however, such inspection will not relieve the Contractor of any responsibility for accuracy or completeness of work. The Contractor shall check the work to verify the accuracy and include documentation of this check in the Survey Records. All Contractor surveying inaccuracies, errors or omissions shall be corrected at the Contractor's expense. Construction Manager's inspection or the Contractor's corrections shall not entitle the Contractor to additional payment or contract time extension.
 - L. Changes: All changes in lines and grades required by field conditions and all discrepancies in grades, alignment, location or dimensions detected by the Contractor shall be immediately submitted to the Construction Manager in writing. No changes in given data or plans will be allowed unless approved by the Construction Manager in writing. All changes shall be documented in the survey records.

END OF SECTION 01050

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to work of this section.
- 1.2 DESCRIPTION: Section includes general administrative requirements and procedures, and related applicable codes.
- 1.3 CODES:
 - A. Obtain all permits, inspections, approvals, and certificates required by law. Conform to all laws, ordinances, rules and regulations applicable to the location of the Work.
 - B. Publication Dates: Comply with codes and standards in effect at the date of the Contract Documents, except where a standard or a specific date or edition is indicated.
- 1.4 SPECIAL WARRANTIES:
 - A. Special warranties are those specified in the Technical Specification Sections, to be provided by a manufacturer or by the Contractor or his subcontractors or combinations thereof. Refer to Section 01701 for submittal of such warranties as a part of the contract completion documentation and procedures.
 - B. All such special warranties must conform to the specification requirements and be signed by persons who have the authority to commit the issuing entity to the warranty. Subcontractor issued warranties must be signed by the Subcontractor and the Contractor.
 - C. All such special warranties are in addition to and not a limitation of other rights the City may have against the Contractor under the Contract Documents.
- 1.5 EXISTING UTILITIES:
 - A. The existence and location of underground utilities and construction indicated as existing are not guaranteed.
 - B. Before starting any work disturbing, moving or penetrating the ground, the Contractor must have all existing utilities located, staked, and depth identified by the appropriate entity.
- 1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE:
 - A. Furnish construction schedule, as required by the construction contract, not less than three (3) copies.

- B. The Contractor shall provide a bar chart schedule covering the duration of the project, beginning with the Notice to Proceed and concluding with Substantial Completion. The following guidelines shall be followed:
 - 1. The bar chart shall contain a sufficient number of activities to allow effective monitoring of the progress of the work. The bar chart shall be cost loaded.
 - 2. Each activity shall contain only the work of a single trade or subcontractor.
 - 3. Each activity shall be less than 10 working days in duration. Procurement and material delivery activities may exceed the 10 working day duration. Longer duration activities shall be broken into two or more individual activities of less than 10 working days duration by area, type of work, etc. to allow for effective monitoring of the Work.
- C. Schedule updating shall be done on a monthly basis. The revision shall indicate actual progress to date, changes resulting from change orders, and planned changes necessary to complete the Work in accordance with the Contract Documents.
- D. All costs associated with the development and maintenance of the schedule shall be borne by the Contractor.
- E. The Contractor shall submit a preliminary bar chart schedule within 10 working days of the Notice to Proceed. The Construction Manager shall review the preliminary bar chart and return comments to the Contractor within 5 working days. The Contractor then shall have 5 working days to review the schedule and return it to the Construction Manager for review. The 5 working day review and review cycles shall continue until an acceptable schedule is received by the Construction Manager. An authorized schedule shall be required for payment.
- F. The schedule may be used as a tool in analyzing any requests for the extension of the contract completion date due to changes in the Work or abnormal weather conditions. Normal weather conditions are based upon the 10 year historical weather information provided by the Lakewood branch of the U.S. Weather Service. Normal weather conditions shall be incorporated into the bar chart schedule. Additional time will be added to the Contract time only if the activities involved will affect the project's Completion Date because of the criticality of the activities changed or altered.

1.8 DELIVERY, STORAGE AND HANDLING:

- A. Properly carton, crate, cover and protect materials, products and equipment for shipping, handling and storing. Use appropriate means for hoisting and loading which will prevent damage or overstress to items being handled or shipped. Store them under roof in controlled environment whenever feasible; otherwise store off the ground under suitable coverings properly secured against wind and weather. Protect all items from rain, snow moisture, wind, cold, heat, frost, sun, staining, discoloration, deterioration and physical damage from any cause. Refer to individual sections for specific requirements.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01105

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to work of this section.
- 1.2 DESCRIPTION: This section includes administrative and procedural requirements for project meetings in the following categories:
- Pre-construction meeting
 - Progress and Coordination meetings
 - Construction Manager-General Contractor review meetings
- 1.3 RELATED SECTIONS:
- A. Pre-bid conference and Site visit: Bidders' Instructions
 - B. Progress schedules: Section 01105
- 1.4 GENERAL REQUIREMENTS:
- A. Construction Manager shall schedule and administer a pre-construction meeting, weekly progress meetings and coordination meetings, and specially called meetings throughout progress of the work including the following:
 - 1. Prepare agenda for meetings.
 - 2. Distribute written notice of each meeting four days in advance of meeting date. Make physical arrangements for meetings.
 - 3. Preside at meetings.
 - 4. Record the minutes; include significant proceedings and decisions.
 - 5. Include all issues of previous meetings until resolved.
 - 6. Reproduce and distribute copies of minutes within four (4) days after each meeting and send to:
 - Participants in the meeting
 - Parties affected by decisions made at the meeting
 - B. Representatives of Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
 - C. Site observations required of the Construction Manager shall be included in or coordinated with the regularly scheduled meetings whenever possible.
- 1.5 PRE-CONSTRUCTION MEETING:
- A. Construction Manager shall schedule a pre-construction meeting to take place within ten (10) days prior to date of Notice to Proceed at a central site location designated by the Construction Manager. Attendance shall include:

Construction Manager
Contractor and Contractor's Superintendent
Maintenance District Superintendent
Others as appropriate

- B. Suggested Agenda: Discuss items of significance that could affect progress including such topics as:

Tentative construction schedule
Critical Work sequencing
Designation of responsible personnel
Procedures for processing field decisions and Change Orders
Procedures for processing Applications for Payment
Distribution of Contract Documents
Submittal of Shop Drawings, Product Data and Samples
Preparation of record documents
Use of the premises
Office, Work and storage areas
Equipment deliveries and priorities
Safety procedures
First aid
Security
Housekeeping
Working hours
Temporary construction facilities and utilities

1.6 COORDINATION MEETINGS:

- A. The Construction Manager will schedule weekly job progress and coordination meetings at the site. Attendance shall include:

Contractor
Subcontractors, as appropriate to the agenda
Suppliers, as appropriate to the agenda
Construction Manager
Others

- B. Suggested Agenda:

Review, approval of minutes of previous meeting.
Review of work progress since previous meeting.
Field observations, problems, conflicts.
Problems which impede Construction Schedule.
Review of off-site fabrication, delivery schedules.
Corrective measures and procedures to regain projected schedule.
Revisions to construction schedule.
Progress, schedule, during succeeding work period.
Coordination of schedules.
Review submittal schedules; expedite as required.

Maintenance of quality standards.
Pending changes and substitutions.
Review proposed changes for:
 Effect on construction schedule and on completion date.
 Effect on other contracts of the project.

1.7 CONSTRUCTION MANAGER-GENERAL CONTRACTOR REVIEW MEETINGS:

- A. Meetings shall be scheduled as necessary to review the general progress of the job and discuss all relevant open issues. The General Contractor's superintendent shall attend these meetings unless agreed to otherwise. Additionally, Subcontractors shall be invited to attend as required and agreed to by the Construction Manager. The Construction Manager shall preside at meetings and take complete minutes. All items shall be tracked in minutes until resolved. Suggested Agenda is similar to Article 1.6.

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION (Not applicable)

END OF SECTION 01200

PART 1- GENERAL

1.1 SUMMARY

- A. The intent of this section is to explain, in general, what is and what is not included in a contract line item, and the limits or cut-off points where one item ends and another begins.
- B. Measurement and payment for each contract item.
- C. If no contract line item exists for a portion of the work, include the costs in a related item.

PART 2- PRODUCTS (Not Used)**PART 3-EXECUTION**

3.1 LIST OF CONTRACT BID ITEMS

BASE BID ITEMS**Bid Item #1- Mobilization and General Conditions**

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work will be on a percentage completed basis. The work in this bid item includes all general conditions, mobilization costs, traffic control, staging area, construction fencing, temporary facilities, permits, taxes, and fees.

Bid Item #2- Erosion Control

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price. The work of this bid item includes application for and obtaining a CDPS Construction Activity Permit from the Colorado Department of Health and Environment (CDPHE), and completing and implementation of the Stormwater Management Plan (SWMP) in accordance with the Contract Drawings and Specifications and the CDPHE regulations. Also included in the work is installation, maintenance and removal of temporary BMPs for erosion and sediment control and the services of a qualified Erosion Control Supervisor with duties as described in the SWMP Drawings.

Bid Item #3- Construction Surveying and Staking

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price. The work of this bid item includes all construction surveying required to complete project as shown on plans.

Bid Item #4- Site Demolition

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price. The work in this bid item includes but is not limited to sawcutting and removal of existing curb and gutter, walkways, ramps, playground edge, surfacing and equipment, shelters, site furnishings, restroom enclosure, drinking fountain, light fixtures, modular block walls, cobblestone, misc.

shrubs and disposal of waste materials. This bid item also includes removal and resetting of signs with concrete footings as indicated on plans.

Bid Item #5- Clearing and Grubbing

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price. The work in this bid item includes all clearing and grubbing, tree removals, and disposal of waste materials.

Bid Item #6- Site Grading and Earthwork

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price. The work of this section consists of topsoil stripping, topsoil stockpiling, general excavation, general embankment, importing, exporting, backfill materials, compaction, placing topsoil, finish grading and incidental work.

Bid Item #7- Concrete Paving-6" Thick Grey

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price per square foot, to include all materials, labor and equipment necessary to install 6-inch thick concrete, grading, sub grade preparation, base course, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill along paving, disposal of excess excavated material for a complete installation.

Bid Item #8- Concrete Curb and Pan- Spill

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price per linear foot, to include all materials, labor and equipment necessary to install concrete curb and pan, grading, sub grade preparation, base course, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill, disposal of excess excavated material for a complete installation.

Bid Item #9- Concrete Curb and Pan- Catch

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price per linear foot, to include all materials, labor and equipment necessary to install concrete curb and pan, grading, sub grade preparation, base course, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill, disposal of excess excavated material for a complete installation.

Bid Item #10- Concrete Flush Curb and Pan- Spill

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price per linear foot, to include all materials, labor and equipment necessary to install concrete flush curb and pan at the accessible parking spaces, grading, sub grade preparation, base course, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill, disposal of excess excavated material for a complete installation.

Bid Item #11- Concrete Driveway Cross Pan

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price per square foot,

to include all materials, labor and equipment necessary to install 6-inch thick concrete, grading, sub grade preparation, base course, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill along paving, disposal of excess excavated material for a complete installation. The work in this bid item shall also include asphalt patch back.

Bid Item #12- Concrete Playground Curb at Rubber Surfacing

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price per linear foot, to include all materials, labor and equipment necessary to install concrete edge, steel reinforcement, grading, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation. This bid item does not include the adjacent concrete walk.

Bid Item #13- Concrete Seat Wall- A

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install concrete, steel reinforcement, grading, formliner, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

Bid Item #14- Concrete Seat Wall- B

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install concrete, steel reinforcement, grading, formliner, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

Bid Item #15- Concrete Low Retaining Wall- C

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install concrete, steel reinforcement, grading, formliner, skate stoppers, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

Bid Item #16- Concrete Seat Wall- D

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install concrete, steel reinforcement, grading, formliner, skate stoppers, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

Bid Item #17- Concrete Stairs and Handrail

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install concrete stairs, steel reinforcement, grading, sub grade preparation, formwork, fiber-reinforcement, finishing, steel powdercoated handrail, backfill along edges, disposal of excess excavated material for a complete installation.

Bid Item #18- Pedestrian Ramp-Type 1A

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price each, to include all materials, labor and equipment necessary to install concrete ramp, grading, sub grade preparation, formwork, fiber-reinforcement, truncated domes, finishing, backfill along edges, disposal of excess excavated material for a complete installation. The work in this bid item shall also include asphalt patch back.

Bid Item 19- Pedestrian Ramp-3B

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price each, to include all materials, labor and equipment necessary to install concrete ramp, grading, sub grade preparation, formwork, fiber-reinforcement, truncated domes, finishing, backfill along edges, disposal of excess excavated material for a complete installation. The work in this bid item shall also include asphalt patch back.

Bid Item #20- Pedestrian Ramp at HC spaces

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price each, to include all materials, labor and equipment necessary to install concrete ramp, grading, sub grade preparation, formwork, fiber-reinforcement, truncated domes, finishing, backfill along edges, disposal of excess excavated material for a complete installation. This bid item also includes accessible parking signs.

Bid Item #21- Parking Lot-Asphalt Paving , including base

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install asphalt paving, base course material, truncated domes, striping, handicap symbols, grading, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation. The work in this bid item shall also include asphalt patch back.

Bid Item #22- Storm Drainage-Water Quality Pond

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install water quality pond and outlet structure as shown on plans. The work includes excavation, trenching, bedding, furnishing, joining and cutting (where necessary), backfill material per the specifications, joint fasteners, and all other materials, labor and equipment to complete the work.

Bid Item #23- Sidewalk Chase

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price each, to include all materials, labor and equipment necessary to install sidewalk chases as shown on plans. The work includes formwork, trench drain and all other materials, labor and equipment to complete the work.

Bid Item #24- Boulder Retaining Walls

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price per linear foot, to include boulders, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work.

Bid Item #25- Large Shade Shelter

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, prefabricated shade shelter, foundation, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work. This bid item also includes engineered and stamped construction plans as provided by the manufacturer to obtain all necessary permits.

Bid Item #26- Small Shade Shelter

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, prefabricated shade shelter, foundation, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work. This bid item also includes engineered and stamped construction plans as provided by the manufacturer to obtain all necessary permits.

Bid Item #27- Picnic Tables

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, picnic tables, mounting hardware, and all materials, labor and equipment necessary to complete the work.

Bid Item #28- Trash Receptacles

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, trash receptacles, mounting hardware, and all materials, labor and equipment necessary to complete the work.

Bid Item #29- Bench

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, bench, mounting hardware, and all materials, labor and equipment necessary to complete the work.

Bid Item #30- Grill

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, grill, mounting hardware, and all materials, labor and equipment necessary to complete the work.

Bid Item #31- Bike Racks

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, bike racks, mounting hardware, and all materials, labor and equipment necessary to complete the work.

Bid Item #32- Pet Waste Stations

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract unit price each, to include, bike racks, mounting hardware, and all materials, labor and equipment necessary to complete the work.

Bid Item #33- Restroom Building and Utilities

Note: The City of Commerce City will purchase the prefabricated restroom building directly from the vendor. This includes engineered and stamped drawings for permitting, delivery and setting in place. Measurement: No unit measurement for payment will be made for this work. Payment: Payment for all work completed will be at the contract lump sum price, to include, coordination with vendor for delivery and setting of building, coordination of all City inspections, compacted pad base material, rigid insulation, meter pit, service connections to electric, water and sanitary sewer as shown on plans, cutting and patching street, final utility connections to the building and all materials, labor and equipment necessary to complete the work.

Bid Item #34- Decorative Pavers at Playground

Measurement: No unit measurement for payment will be made for this work. Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install decorative pavers, grading, sub grade preparation, base course, formwork, paving pattern template per the specifications, concrete border, finishing, backfill along paving, disposal of excess excavated material for a complete installation.

Bid Item #35- Deciduous Shade Trees

Measurement: No unit measurement will be made for this work. Payment: Payment for all work included will be at the contract unit price each. The work in this bid item includes, but is not limited to all trees, excavation, amendments, fertilizers, tree stakes, saucers, and wood mulch as shown on plans and all equipment, materials and labor to complete the work.

Bid Item #36- Deciduous Ornamental Trees

Measurement: No unit measurement will be made for this work. Payment: Payment for all work included will be at the contract unit price each. The work in this bid item includes, but is not limited to all trees, excavation, amendments, fertilizers, tree stakes, saucers, and wood mulch as shown on plans and all equipment, materials and labor to complete the work.

Bid Item #37- Bluegrass Sodding

Measurement: No unit measurement will be made for this work. Payment: Payment for all work included will be at the contract unit price per square foot. The work in this bid item includes soil preparation, amendments, fine grading, sod, rolling, fertilizing and all equipment, materials and labor to complete the work. This bid item includes all areas to be sodded per plans as well as any additional disturbed areas as a result of site construction.

Bid Item #38- Irrigation System

Measurement: No unit measurement will be made for this work. Payment: Payment for all work included will be at the contract lump sum price. The work in this bid item includes all sleeving, laterals, mainline, valve boxes, wiring, spray heads, rotors, trenching, excavation and all equipment, materials and labor to complete the work to maintain a fully functional irrigation system. This bid item includes all repairs to existing landscape as required to install irrigation through existing landscape areas.

Bid Item #39- Drinking Fountain

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price. The work in this bid item includes all connections to existing water line, new water line pipe as required, concrete pad, excavation, specified drinking fountain, all equipment, materials and labor to complete the work to maintain a fully functional drinking fountain.

Bid Item #40- Playground Installation

Note: The City of Commerce City will purchase the playground equipment directly from the vendor including installation of equipment and poured in place rubber surfacing. The contractor will be responsible for coordinating with the vendor and preparing subgrade, 4" concrete subbase, concrete playground curb and gravel sump pits. Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract lump sum price, to include coordination with playground vendor, grading, all materials, labor and equipment necessary to install 4-inch thick concrete, grading, sub grade preparation, base course, gravel sump pits, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill along paving, disposal of excess excavated material for a complete installation.

Bid Item #41- Site Lighting/ Electrical

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract lump sum price, to include, pedestrian light fixtures, parking lot fixtures, poles, shelter lights, connections to restroom building, electric outlets, conduit, wiring, meter, electrical panels, and all other related materials, labor and equipment necessary to complete the work as shown on plans.

Bid Item #42- Basketball Court

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price, to include all materials, labor and equipment necessary to install post tension concrete court, reinforcement, grading, sub grade preparation, formwork, basketball goals, backboard, paint striping, fiber-reinforcement per the specifications, concrete, finishing, backfill along paving, disposal of excess excavated material for a complete installation.

Fitness Court

Note: The City of Commerce City will be contracting out the 40' x 40' fitness court concrete paving and subbase material as a separate project, due to grant funding requirements. The contractor will be responsible for all clearing and grubbing of this area, grading/ excavation in preparation for paving by others, adjacent irrigation and sodding. This work is included in other bid items.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General contract Conditions, Drawings and other Division 1 - Specification sections apply to work of this section.
- 1.2 DESCRIPTION: Section includes administrative and procedural requirements for submittal and review of product data, shop drawings, samples and similar items required by the specifications.
- 1.3 ADMINISTRATIVE SUBMITTALS:
- A. Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
- Schedules
 - Permits
 - Applications for payment
 - Schedule of Values
 - Closeout documents
 - Coordination drawings
- B. Such submittals are for information and record and do not require action on the part of the Construction Manager except where not in conformity with the Contract documents. If such non-conformity is observed, the Construction Manager will notify the Contractor. Failure to be observed or to be notified by the Construction Manager does not relieve Contractor of compliance with Contract Documents.
- 1.4 SUBMITTAL PROCEDURES:
- A. General: Make submittals from Contractor to the Construction Manager after Contractor has reviewed each submittal and indicated his action thereon except for samples and selection submittals.
- B. Scheduling:
1. Within 20 days after Notice to Proceed, prepare a separate listing and schedule organized by related specification section number sequence, showing the principal work-related submittals and their initial submittal dates as required for coordination of the work.
 2. Coordinate the submittal schedule with the construction schedule. Prepare the submittal schedule in chronological order.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

D. Coordination:

1. Coordinate the preparation and processing of submittals with the performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
3. Coordinate transmittal of different types of submittals for related elements of Work so processing will not be delayed by the need to review submittals concurrently for coordination.
4. The Construction Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

E. Processing:

1. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
2. Allow five (5) days for processing each submittal.
3. No extension of Contract Time will be authorized because of failure to transmit submittals to the Construction Manager sufficiently in advance of the Work to permit processing.

F. Submittal Transmittal:

1. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to the Construction Manager using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
2. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.5 SHOP DRAWINGS:

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project shall not be considered to be a shop drawing. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
- Dimensions
 - Identification of products and materials included
 - Compliance with specified standards
 - Notation of coordination requirements

Notation of dimensions established by field measurement

- B. Submit four (4) copies of each shop drawing.

1.6 PRODUCT DATA:

- A. Assemble Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings". Where applicable include maintenance manual.
- B. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

- Manufacturer's printed recommendation.
- Compliance with recognized trade association standards.
- Application of testing agency labels and seals.
- Notation of dimensions verified by field measurement.
- Notation of coordination requirements.

- C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- D. Submit copies as above specified for final shop drawings. Submit a cover letter to show Contractor's review and action. Where applicable, include additional copies for maintenance manuals.
- E. Submit four (4) copies of product data.

1.7 SAMPLES:

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components. Include the following:
 - Generic description of the Sample.
 - Sample source.
 - Product name or name of manufacturer or supplier.
 - Compliance with recognized standards.
 - Availability and delivery time.
- B. Submit Samples to the Construction Manager who will review them for a final check of elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

1. Where variation in characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
 2. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
- C. Submittals:
1. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets: one will be returned marked with the action taken.
 2. Maintain one (1) complete set of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.
- D. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01300

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division 1-Specification sections apply to work of this section.
- 1.2 DESCRIPTION: This Section includes administrative and procedural requirements for quality control services.
- Field samples
 - Mock-ups
 - Inspection and testing laboratory services
 - Manufacturer's field services and reports
- 1.3 RELATED SECTIONS:
- A. Inspections, testing and approvals required by public authorities: General Conditions.
 - B. Submittals: Section 01300
Inspections and tests required and standards for testing: Individual Specification sections.
- 1.4 REFERENCES:
- A. ASTM D3740, "Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction".
 - B. ASTM E329, "Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction".
 - C. Should specified reference standards conflict with the Contract Documents, request clarification from the Construction Manager before proceeding.
- 1.5 DEFINITIONS:
- A. Quality control services include inspections and tests, and related actions, including reports, performed by independent agencies, governing authorities, and the Contractor. Contract enforcement activities performed by the Construction Manager are not included.
 - B. Inspection and testing services required to verify compliance with requirements specified do not relieve the Contractor of responsibility to comply with requirements of the Contract Documents.
 - C. Requirements of this Section relate to customized fabrication and installation procedures and not production of standard products.

1. Specific quality control requirements, inspections and tests, covering production, customized fabrication and installation procedures of standard products are specified in the individual sections.
2. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Documents.
3. Requirements for the Contractor to provide quality control services requested by the Construction Manager or authorities having jurisdiction are not limited by provisions of this Section.

1.6 RESPONSIBILITIES:

A. Contractor Responsibilities:

1. The Contractor shall provide inspections, tests and similar quality control services, specified in individual specification sections and required by governing authorities, except where they are indicated to be the responsibility of the City, or are provided by another entity. Costs for City services shall not be included in the Contract Sum or bid item.
2. Notify the Construction Manager at least one (1) working day in advance so that the Construction Manager may observe the tests.

B. Retesting:

1. The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not meet specified requirements, regardless of whether the original test was the Contractor's responsibility.
2. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility regardless of the results, where required tests were performed on original construction.

C. Limitations: Where manufactured products or equipment are required to have representative samples tested, do not use such materials or equipment until tests have been made and the materials or equipment are found to be acceptable. Do not incorporate in the work any product that becomes unfit for use after acceptance.

D. Associated Services: The Contractor shall cooperate with Construction Manager or other agencies performing required inspections, tests and similar services and provide reasonable associated services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Associated services required include:

1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

4. Providing adequate facilities for safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours after casting as required by ASTM C31.
5. Providing the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
6. Security and protection of samples and test equipment at the project site.

E. City's Responsibilities:

1. The Construction Manager will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by authorities having jurisdiction or another identified entity. Costs for these services are not included in the Contract Sum.
2. The Construction Manager will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the City's responsibility.
3. Duties of Testing Agency:
 - a. The independent testing agency engaged to perform inspections, sampling and testing of materials shall cooperate with the City and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
 - b. The agency shall notify the City and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - c. The agency is not authorized to release, revoke, alter or enlarge any requirement of the Contract Documents, or approve or accept any portion of the Work.
 - d. The agency shall not perform any duties of the Contractor.
4. Coordination:
 - a. The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - b. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS:

- A. General: Refer to Section 01300 for general requirements of submittals. Certified written report of each inspection, test or similar service, will be submitted directly to the Construction Manager except to the Contractor with copy to the Construction Manager when service is the Contractor's responsibility. Submit additional copies directly to governing authorities when requested by that authority.
- B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

1. Date of issue.
2. Project title and number.
3. Dates and locations of samples and tests or inspections.
4. Names of individuals making the inspection or test.
5. Designation of the work and test method.
6. Identification of product and specification section.
7. Complete inspection or test data.
8. Test results and interpretation of test results.
9. Ambient conditions at the time of sample taking and testing.
10. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
11. Name and signature of laboratory inspector.
12. Recommendations on retesting.

1.5 QUALITY ASSURANCE:

- A. Qualification of Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by American Council of Independent Laboratories, which are recognized in the industry as specialized in the types of inspections and tests to be performed and which have not less than five (5) years experience in such testing.
- B. Comply with requirements of ASTM E329 and ASTM D3740.
 1. Each inspection and testing agency shall be authorized to operate in the State of Colorado.
 2. Maintain a full time registered engineer on staff to review services.
 3. Calibrate testing equipment at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or of accepted values of natural physical constants.
- C. Control of Installation:
 1. Monitor quality control over products, services, site conditions, and workmanship to produce work of specified quality.
 2. Comply fully with manufacturers' instructions, including each step in sequence.
 3. Should manufacturers' instructions conflict with Contract Documents, request clarification from Construction Manager before proceeding.
 4. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
 5. Perform work by persons qualified to produce workmanship of specified quality.

1.6 FIELD SAMPLES:

- A. Install field samples for review at the site as required by individual specification sections.
- B. Assemble and erect specified items with specified or required attachment and anchorage devices, flashings, seals, and finishes.

1.7 INSPECTION AND TESTING LABORATORY SERVICES:

- A. Perform inspections, tests and other services specified in individual specification sections.
- B. Submit reports indicating observations and results of tests indicating compliance or non-compliance with Contract Documents.

1.8 MANUFACTURER'S FIELD SERVICES:

- A. When specified in respective Specification sections, Contractor shall require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting and balancing of equipment as applicable, and to make appropriate recommendations.
- B. Manufacturer's representative shall submit written report to the Construction Manager listing observations and recommendations.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.1 The City will pay for testing for soil and aggregate compaction, concrete, topsoil and inert groundcover materials. The Contractor will pay for any retesting as a result of test failures.

3.2 REPAIR AND PROTECTION:

- A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

3.3 SCHEDULE OF INSPECTIONS AND TESTS: The following is a summary of tests and inspections specified in the appropriate sections and compiled here for convenience of reference. Additional testing as referenced in individual sections will also be required.

A. Testing Paid by Owner's Representative (Initial Test Only):

1. Fill and backfill compaction density tests: Section 02200.
2. Asphalt Pavement: Section 02745.
3. Concrete Walks: Section 02520.
4. Concrete Testing: Section 03300.

B. Testing Paid By Contractor:

1. Contractor to pay for retesting if further tests are required.
2. Testing of Water Lines: In conformance with City Standards.

C. Schedule of quality control tests and inspections.

<u>Test/Inspection Description</u>	<u>ASTM Test Frequency</u>
Section 02200:	
Fill and backfill material	1 per each soil type
Proctor	D698
Plasticity index	D4318
Particle size analysis	D422
Field density tests	D2922
Field moisture tests	D3017
General fills for building and paved areas	1 per 2000 SF
Backfill	1 per 250 SF
Site work	1 per 400 CY
Utility lines	1 per 150 LF
Section 02520:	
Asphaltic Concrete	1/day or each 500 tons
Marshall	D1559
Extraction/gradation	D2172, C136
Field density-nuclear cores	D2950
	CDOT CP-44
Section 03300:	
Reinforcing steel	Examine reinforcing before each pour
Physical Properties	1/50 CY concrete physical properties on each truck C172, C173, C 143
Compressive strength	C39

END OF SECTION 01400

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division 1-Specification sections apply to this section.
- 1.2 DESCRIPTION: Section includes minimum requirements for traffic control, temporary detours, barricades, services, utilities and other facilities. Construction cleaning methods and waste removal are also included. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication that such temporary activity is not required for successful completion of the work. The use of alternative facilities equivalent to those specified is the Contractor's option, subject to the Construction Manager's acceptance.
- 1.3 QUALITY ASSURANCE:
- A. Standards:
1. Comply with governing regulations, industry standards and utility company regulations and recommendations, including, but not limited to, codes, permits, inspections, testing, and health, safety, fire, pollution and environmental regulations.
 2. Signage and Barricades: All signs, barricades, or other traffic control measures shall be in conformance with the requirements of the "Manual of Uniform Traffic Control Devices for Streets and Highways", U.S. Department of Transportation, Federal Highway Administration, including State of Colorado supplements or as detailed in the Contract Documents.
- B. Temporary Utilities:
1. Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 2. Arrange with the company for a time when service can be interrupted, if necessary, to make connections for temporary service.
- 1.4 SUBMITTALS:
- A. Traffic Control Plan: Prior to start of construction, submit traffic control plan for approval by the Construction Manager. Work within City right-of-ways that impacts pedestrian or vehicular traffic requires approval of the traffic control plan and issuance of a street occupancy permit by the Department of Public Works.
- 1.5 PROJECT CONDITIONS:
- A. Scheduled Uses: Provide temporary facilities and services at the time first needed at the site; and maintain, expand and modify the facilities as needed throughout the construction period. Do not remove service until it is no longer

needed. At the earliest feasible time, and when acceptable to the Construction Manager, change over from the use of temporary utility service to permanent service.

- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

- A. Provide either new or used materials and equipment for temporary facilities. Such materials shall be in substantially undamaged and serviceable condition. Provide types and qualities that are recognized in the construction industry as suitable for the intended use in each application.
- B. Barricades and Signs shall meet the requirements of ANSI D6.1-78, "Manual on Uniform Traffic Control Devices."

2.2 TEMPORARY FENCES AND BARRICADES:

- A. General: Material may be new or used, but shall be suitable for intended purpose. Fences and barriers shall be structurally adequate and neat in appearance.
- B. Construction Barrier Fencing: Plastic orange mesh construction fence, 4' height. 6' height metal T-Post at 10'0" maximum spacing.
- C. Portable Chain Link Fencing: Shall be open mesh fencing, 6-ft. height, with top and bottom rails. Posts shall be spaced at max. 8-feet on center, and be equipped with cross bar bases for stability. Weigh bases down with sandbags if required. Provide with lockable gates. Portable chain link fencing shall be required around all playground equipment installations.
- D. Barrier Tape: Banner Guard, imprinted with "CAUTION: CONSTRUCTION AREA", manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

2.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES: Refer to Section 01565.

2.4 CLEANING MATERIALS: Use only cleaning materials recommended by manufacturer of surface to be cleaned.

PART 3 – EXECUTION

3.1 TEMPORARY FACILITIES:

- A. Sanitary Facilities: Install temporary toilets in available locations which will best serve the needs of personnel at the project site.
- B. Barricades, Warning Signs and Lights: Erect and maintain barricades, lights, danger signals, and warning signs in accordance with ANSI D6.1 and the approved Traffic Control Plan
 - 1. The Contractor shall take all measures necessary to provide safety for the public as part of his construction practices.
 - 2. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry into the work area.
 - 3. Adequately barricade and post all open cuts in the project area. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.
 - 4. Barrier Tape: Install where needed. Keep a minimum of two rolls on site at all times.
 - 5. Cover pipes, hoses, and power lines crossing sidewalks and walkways with troughs using beveled edge boards.
 - 6. Provide adequate signage to direct both vehicular and pedestrian traffic.
 - 7. Removal: Completely remove barriers no longer needed and when approved by the Construction Manager.
- C. Enclosure Fence (Chain link fence):
 - 1. Where required or as directed by the Construction Manager, provide temporary chain link fence to enclose partially completed areas of construction that pose a severe safety hazard to the public (e.g., playground equipment). Provide locking entrance to prevent unauthorized entrance, vandalism, theft and similar violations of security. Maintain the fence throughout the course of construction and remove only upon approval of the Construction Manager.
 - 2. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- D. Temporary Construction Fencing (plastic orange mesh):
 - 1. Provide as shown on plans to protect landscape areas and direct pedestrian traffic to play areas and garden.

3.2 PROTECTIVE MEASURES:

- A. Protection of the Work:

1. The Contractor shall obtain the advice and recommendations of his installers for procedures to protect their work. Installers are responsible for protecting their work and that of other trades in overlapping and adjacent areas. When the Installer is no longer working in the area or at the job, the Contractor shall provide protective measures and materials to assure that each element will be protected from damage or deterioration (other than normal weathering for exterior exposed materials) until Final Acceptance. Remove protective coverings and materials at the appropriate time but no later than final cleaning operations.
 2. Always protect excavations and trenches from damage by rain water, spring water, ground water, or backed up drains or sewers. Provide pumps or other equipment as required.
- B. Cold Weather Protection: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed.
- C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation to remain in place, against damage to roots, trunks or branches. Do not stockpile construction materials or excavated materials within drip line. Provide temporary guards to protect trees and vegetation to be left standing. Refer to Section 02950.
- D. Environmental Protection: Conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result.
1. Take all necessary reasonable measures to reduce air and water pollution by any material or equipment used during construction.
 2. The contractor shall take all reasonable measures to reduce noise pollution from construction operations.

3.3 CLEANING UP:

- A. Clean-Up During Construction:
1. Oversee cleaning and ensure that grounds and public properties are maintained free from accumulation of waste materials and rubbish.
 2. Take measures to prevent spread of trash, debris, cartons, packaging or other waste materials on or off the Project Site by wind.
 3. At reasonable intervals during progress of work, clean up site and access and dispose of waste materials, rubbish and debris.
 4. Clean adjacent and nearby streets of dirt occasioned by construction operations; frequency and methods as required by governing authority.
 5. Keep volatile wastes in covered containers.
 6. Utilize excavated material as soon as possible.

- B. Wet down dry materials and rubbish to prevent blowing dust. Blowing dust from the construction areas to the public areas of the park will not be allowed. The contractor must keep dust under control at all times.

3.4 WASTE DISPOSAL:

- A. Collection and Disposal of Wastes: Establish and enforce a daily system for collecting and disposing of waste materials from construction areas and elsewhere at the project site. Provide suitable trash containers at a central collection point on the site.
 - 1. Burning or burying of waste materials on the project site is not permitted.
 - 2. Disposal of volatile fluids and wastes in storm sewers, sanitary sewers, septic systems, or into streams or waterways is not permitted.
 - 3. Immediately remove hazardous rubbish from project site.
 - 4. Recycle as much as possible.
- B. Provide daily sweeping and clean-up of dust, debris, litter trash containers and other items required to maintain a clean, orderly and accessible site. Hauling of debris to legal dump or landfill is required weekly as a minimum.
- C. Waste concrete shall be removed from the site and legally disposed of by masonry and concrete installers.
- D. Construction Debris:
 - 1. Remove construction debris, as determined by the Construction Manager, and dispose of off site. Replace with approved clean soils, in accordance with Section 02200, using materials appropriate to the location on the site and methods specified for fills and backfills.
 - 2. Construction debris includes, but is not limited to, waste concrete, debris and waste materials; areas used for cleaning tools, washing mixers and concrete trucks and areas containing oils, solvents, and similar liquids or their residues.

END OF SECTION 01500

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division - 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: This work consists of furnishing, constructing, installing, maintaining, and removing when required, erosion control measures during the life of the contract to prevent or minimize erosion, sedimentation, and pollution of any state waters including wetlands.
- A. In general, the Stormwater Management Plan (SWMP) covers the following operations:
1. Roadway demolition;
 2. Removal and stockpiling of materials;
 3. Utility installation, including storm, sanitary, and water distribution systems;
 4. Abandonment of existing utilities;
 5. Installation of public utilities including telephone, electric, gas, and television; and,
 6. Construction of roadways including fine grading, aggregate base course, curb and gutter, sidewalks, bike paths, paving, and landscaping.
- B. During demolition, the following will occur:
1. All storm inlets will be protected;
 2. Placement of construction entrance and exits where called for in the plans;
 3. Hay bale barriers will be placed where needed, and/or as directed by the Construction Manager;
 4. Silt fence will be placed where needed, and/or as directed by the Construction Manager; and,
 5. When needed and/or as directed by the Construction Manager, temporary detention basins will be created.
- C. Each of these items will be subject to the methods shown in the SWMP. Any stockpiles will be surrounded by a silt fence. Permanent stockpiles will be seeded.
- D. Upon construction of the new storm system, the new inlets will be protected and will remain protected throughout the duration of the project. It will not be necessary for inlets leading to abandoned storm sewer lines to be further protected. Such lines will be plugged in accordance with City and County standards. Inlets leading to storm sewer lines or portions of storm sewer systems to be reused will be protected throughout the duration of the project.
- 1.3 SUBMITTALS: As specified in Section 01300. Submit one (1) square yard of erosion control blanket, and samples of posts and filter fabric.

- A. Modifications: The Contractor may submit modifications to the Contracts ESCMs (Erosion and Sediment Control Measures) in a written proposal to the Construction Manager as least 10 days prior to beginning any construction work. The written proposal shall include the following:
1. Reasons for changing the ESCMs, as designed and provided for in the contract;
 2. Diagrams showing details and locations of all proposed changes;
 3. A list of appropriate pay items indicating new and revised quantities;
 4. Schedules for accomplishing all revised ESCM work;
 5. A description of the effects on existing permits or certifications caused by the proposed changes;
 6. A description of the effects on the cost of implementing the ESCMs, as proposed to be revised or amended.
- B. The Construction Manager will approve or reject the written approval in writing within two weeks after the submittal date. The Construction Manager may order additional ESCMs if the measures proposed by the contractor prove to be or are deemed insufficient, inadequate, or otherwise ineffective. The Contractor shall be responsible for any amendments to permits or certifications required as a result of the approved changes to the ESCMs. The changes to the ESCMs shall not be reason for and extension of contract time.

1.4 PRODUCT HANDLING:

- A. Deliver erosion control materials in acceptable condition in original, unopened containers, where applicable.

1.5 SCHEDULING:

- A. At least 10 days prior to the beginning of any construction work, the Contractor shall submit for approval by the Construction Manager a schedule of temporary and permanent ESCM work. This schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent erosion control features. The schedule shall include ESCM work for all areas within the project boundaries, including haul roads, borrow pits, storage sites, and plant sites. No work shall be started until the ESCM schedule has been approved in writing by the Construction Manager.
- B. Once the work has started, and throughout the duration of the project, the Contractor shall update the schedule for all ESCM work on a weekly basis, and shall submit the updated schedule to the Construction Manager. If during construction the Contractor proposed changes which would affect the Contractor's ESCM plan, the Contractor shall propose revised ESCMs to the Construction Manager for approval in writing before implementing such changes.
- C. The Contractor shall incorporate into the project all ESCMs, as well as spill prevention and containment measures, at the earliest practicable time as outlined in the accepted schedule.

1.6 MAINTENANCE:

- A. The Contractor shall continuously maintain all ESCMs so that they perform their intended function(s) during construction and work suspensions until the project is completed and accepted.
- B. From the time seeding and mulching work begins until the date the project is declared complete, the Contractor shall keep all seeded areas in good conditions at all times. Any damage to seeded areas or to mulch materials shall be promptly repaired, or at such time and in such a time frame as directed by the Construction Manager.
- C. If the Contractor fails to maintain the ESCMs in accordance with Contract, or as directed by the Construction Manager, the Construction Manager may, after 48 hours following issuance of written notice to the Contractor, proceed to maintain the ESCMs as deemed necessary. The cost thereof will be deducted from any compensation due, or which may become due, to the Contractor under this contract.
- D. Temporary ESCMs shall be removed upon completion of the project, unless otherwise directed by the Project Manager. At the completion of the project, removed temporary ESCMs and their component materials shall become the property of the Contractor.

PART 2: PRODUCTS

- 2.1 EROSION CONTROL BLANKET: Shall be 100 % agricultural straw with photodegradable top and bottom net, equal or better than Type S150 by North American Green, 14649 Highway 41 North, Evansville, IN 47711, Phone: 1-800-772-2040. Secure with 11 gauge wire staples forged into "U" shape, 6" length.
- 2.2 SILT FENCE MATERIALS:
 - A. Fabric: Shall be Amoco 2130 Silt Fence Fabric as manufactured by Amoco Fabric and Fibers Company, Atlanta, TA 30339, telephone 800-445-7732 or approved equal. Provide securing pins as recommended by fabric manufacturer.
 - B. Posts: 2" x 2" wood, min. 4'-6" length as approved by the Construction Manager.
 - C. Brace Wire: Two strands, smooth 9 gauge wire, twisted.
- 2.3 EROSION BALES: Shall be straw, hay, or other approved material(s), containing approximately 5 cubic feet of material and weighing not less than 35 pounds each. Erosion bales shall be string-tied.

PART 3: EXECUTION

3.1 GENERAL:

- A. Unforeseen conditions: The Contractor shall design and implement ESCMs for correcting conditions unforeseen during the design of the project, or for emergency situations that may arise during construction. ESCMs prepared and proposed by the Contractor shall be reviewed and approved by the Engineer prior to installation.
- B. Work outside the project area: In areas outside the project area that are used by the Contractor and which include, but are not limited to, borrow pits, haul roads, storage sites, disposal sites, maintenance areas, batching areas, etc., ESCM work shall be performed by the Contractor at the Contractor's expense.
- C. Stabilization: The term "permanent stabilization" means to cover disturbed areas with final seed and mulch as indicated in the plans. When required in the plans, an erosion control blanket shall be used in combination with the final seed and mulch. The term "temporary stabilization" means to cover disturbed areas with seed, mulch, mulch with a tackifier, or a combination seed/mulch/tackifier, or to use a soil stabilization technique such as surface roughening. Other permanent or temporary soil stabilization techniques can be proposed, in writing, by the Contractor and used upon approval, in writing, by the Construction Manager.
- D. Under no conditions shall the surface area of erodible earth material exposed at any one time by clearing/grubbing and/or earthwork operations exceed 34 acres, with no more than 17 acres attributable to earthwork operations. The Contractor shall permanently stabilize each 17-acre increment of the project immediately upon completion of grading within that section. Once earthwork has begun on a section, it shall be pursued until completion.
- E. The duration of exposed, uncompleted construction shall be as short as practicable. Completed areas shall be permanently stabilized within seven days after completion. Disturbed areas where work is temporarily halted shall be temporarily stabilized within seven days after the activity ceased, unless work is to be resumed within 30 days after the activity ceased.
- F. Clearing and grubbing operations shall be scheduled and performed so that grading operations and permanent stabilization measures can follow immediately thereafter if the permit conditions permit. Otherwise, temporary stabilization measures may be required between successive construction phases or stages.
- G. Upon failure of the Contractor to coordinate the permanent stabilization measures with the grading operations in a manner which effectively controls and prevents water pollution, the Construction Manager will suspend the Contractor's grading operations and withhold monies due to the Contractor on current and subsequent estimates until such time that all aspects of the work are coordinated in an acceptable manner.

- H. ESCMs shall comply with the SWMP and shall be in accordance with these specifications. In the case of an apparent conflict between these two documents, the Contractor shall make a written request for clarification to the Engineer. Within a period of 48 hours from receipt of the Contractor's request, the Engineer will issue a written clarification.

3.2 EROSION CONTROL BLANKET:

- A. Areas to Be Protected: Apply blanket to any area which is vulnerable to soil erosion such as swales or steep slopes IN EXCESS OF 4:1.

- 1. If Contractor fails to net such areas and soil erosion subsequently occurs, Contractor shall re-establish finish grade, soil preparation, seed bed, and apply specified erosion control blanket at his own expense.

- B. Installation:

- 1. Roll out in direction of flow after seeding and mulching.
 - a. Apply material loosely and smoothly on soil surface without stretching.
 - b. Avoid walking directly on seed-bed either before or after jute is applied.
 - c. Bury up-channel end of each piece of jute netting in narrow trench 6" deep. After jute is buried, tamp trench firmly closed.
- 2. In cases where one roll of blanket ends and second roll is needed, overlap up-channel piece over second roll by at least 18". Where two or more widths of netting are applied side by side, make overlap of at least 4".
- 3. Outside Edges of Blanket: Spread loose topsoil over edges to allow for smooth entry of water.

- C. Stapling: Staple overlaps which run parallel to direction of flow in channel bottoms at 2 foot intervals. Staple outside edges, centers and overlaps on banks at 2 foot intervals.

- 1. Each Width of Cloth: Install row of staples down center as well as along each side.
- 2. Staple check slots and junctions of new rolls across channel at 6" intervals.
- 3. On soft or sandy soil or in windy areas, apply staples in alternate slanting position and space at 14" to 18".
- 4. For extra hard soil or shale areas, use sharp hardened steel 3" fence type staples. Do not use 3" staples on normal turf.

3.3 SILT FENCE: Silt fence shall be installed prior to any grubbing or grading activity. Refer to details for installation directions. Refer to layout drawings for location. Construction Manager shall approve fencing and location before final installation.

- A. Posts: Erect where indicated; space not more than 10 feet on center. Extend all posts equal distance above grade.

- B. Brace Wire: Secure brace wire to each post. Prior to attachment, tuck or roll filter fabric around brace wire. Secure filter fabric to brace wire with wire ties 8" O.C.
 - C. Fabric: Attach to posts as approved by Construction Manager, on uphill side of posts. Embed fabric in shallow trench as indicated.
 - D. Upon completion, posts and fabric shall be plumb. Maintain silt fence in plumb position and in good condition.. Replace broken posts, ripped fabric, and re-attach broken fabric to post connections. Remove built-up silt after a storm, also inspect on a weekly basis to maintain in proper condition. Sediment shall be removed from behind the fence when it accumulates to one-half the exposed geotextile height, or when directed by the Construction Manager.
 - E. Removal: Upon completion of the work of this contract, the silt fence shall be left in place with all caught foreign debris removed and disposed of in accordance with Section 01500. Silt fence shall be removed only after the vegetation has been established as determined by the Construction Manager.
- 3.4 EROSION BALES: The bales shall be embedded into the soil and shall be anchored securely to the ground with wooden stakes. Stakes shall have a minimum cross-section dimension or diameter of two inches. Reinforcing steel (rebar) shall not be used. Gaps between bales shall be filled with straw or hay to achieve tight joints. Installation shall be consistent with the details in the plans, and shall be at locations established by the Construction Manager.
- 3.5 TEMPORARY BERMS: Berms shall be constructed as directed by the Construction Manager, and shall be constructed of compacted soil. The berms shall be constructed to drain to a designated inlet or outfall point. Berms shall be compacted with a minimum of two passes of a rubber-tired vehicle, such as a front-end loader or grader.
- 3.6 STORM SEWER INLET PROTECTION: Storm sewer inlet protection measures shall be constructed in a manner that will facilitate maintenance, and that will minimize interference with construction activities. At excavated drop inlet sediment traps, sediment shall be removed when it has accumulated to one-half the design depth of the trap. Storm sewer inlet protection shall be removed only after upstream disturbed areas have been stabilized.
- 3.7 SEDIMENT TRAP AND BASINS: Sediment traps and basins shall be installed before any land disturbance takes place in the drainage area. If an excavated trap or basin is required, then the excavated soil may be used to construct the dam embankment, provided the excavated soil meets the requirements of Section 02200. The area under the embankment shall be cleared, grubbed, and stripped of all vegetation and root mat. Fill material for the embankment shall be free of roots or other woody vegetation, organic material, large stones, and other objectionable material. Embankment construction shall conform to the requirements of Section 02200. Sediment shall be removed from the trap or basin when it has accumulated to one-half of the wet storage depth of the trap or basin.

3.8 SEEDING, MULCHING AND SODDING: Seeding, mulching, and sodding shall be performed in accordance with Sections 02933.

3.9 CLEAN-UP:

- A. Disposal of Sediment: Sediment removed during maintenance of ESCMs shall be used in or on embankments provided the material meets conditions of Section 02200.
- B. Upon completion of work, remove debris and restore ground surface to match adjacent areas. Leave area in clean, acceptable condition.

END OF SECTION 01565

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: This section includes administrative and procedural requirements governing the Contractor's selection of products for use in the project.
- 1.3 DEFINITIONS: Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
- A. Products: Are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "Product" includes the terms "material", "equipment", "system" and terms of similar intent.
 - B. Named Products: Are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - C. Materials: Are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - D. Equipment: Is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.
- 1.4 SUBMITTALS:
- A. Product List: A list of products is included in each appropriate specification division. Prepare a schedule in tabular form showing each product listed. Include the manufacturer's name and proprietary product names for each item listed.
 - 1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
 - 2. Form: Prepare product list with information on each item tabulated under the following column headings:
 - a. Related Specification Section number.
 - b. Generic name used in Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.
4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variation from Contract requirements.
5. Action: The Construction Manager will respond in writing to Contractor within 2 weeks or receipt of the completed product list. No response within this period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents. The Construction Manager's response will include a list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.5 QUALITY ASSURANCE:

A. Source Limitations:

1. To the fullest extent possible, provide products of the same kind from a single source.
2. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Construction Manager to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The

nameplate shall contain the following information and other essential operating data:

- a. Name of product and manufacturer
- b. Model and serial number
- c. Capacity
- d. Speed
- e. Ratings

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 6. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.7 GENERAL PRODUCT REQUIREMENTS:

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. It is the responsibility of the Contractor and his Installers, as experts, to notify the Construction Manager of any specified product that to his knowledge will not meet the requirements or is unsuited to the application indicated or specified.

- C. The use of manufacturer's and trade names is intended only to establish standards of quality and performance and not to limit competition.
- D. Substitution of Materials and Equipment: All bids are to be based on those materials and equipment specified in the Contract Documents. The Construction Manager will be the sole judge of the acceptability of substitute materials and equipment and may accept or reject such substitutes at any time. If a bid is based on a substituted material or equipment, the Construction Manager may require a bidder to supply those materials or equipment specified in the Contract Documents at no increase in contract price and with no extension of the period of performance. Substitution after the bid will be made per Title 406 of the General Contract Conditions.

PART 2: PRODUCTS

- 2.1 PRODUCT SELECTION PROCEDURES: The Contract Documents and governing regulations govern product selection. Procedure governing product selection include the following:
- A. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
 - B. Semi-proprietary Specification Requirements:
 - 1. Where Specifications name two or more products or manufacturers, provide one of the products indicated. No substitutions will be permitted.
 - 2. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 - C. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 - D. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 - E. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.

- F. Compliance with Standards, Codes and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
- G. Visual Matching:
 - 1. Where Specifications require matching an established Sample, the Construction Manager's decision will be final on whether a proposed product matches satisfactorily.
 - 2. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
- H. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Construction Manager will select the color, pattern, and texture from the product line selected.

PART 3: EXECUTION

- 3.1 INSTALLATION OF PRODUCTS: Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to this section.
- 1.2 DESCRIPTION: This Section includes:
- A. Administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Inspection procedures.
 - 2. Submittal of warranties, maintenance manuals, and record drawings.
 - 3. Specific requirements for individual units of work are specified in those specification sections that relate to the work.
 - B. Contractor's responsibility is to complete the project in accordance with the Contract Documents and to enforce their requirements on his employees, suppliers and Subcontractors.
- 1.3 SUBSTANTIAL COMPLETION:
- A. Refer to the General Contract Conditions for procedures regarding Substantial Completion.
- 1.4 FINAL ACCEPTANCE:
- A. Refer to the General Contract Conditions for procedures regarding Final Completion and Acceptance of the Work.
- 1.5 CLOSEOUT DOCUMENTS: In order to complete the Project, provide the following documents:
- A. Printed Warranties as specified in the appropriate Sections.
 - B. Parts and Maintenance materials as specified in the appropriate Sections.
 - C. Project record drawings on reproducible mylar.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION**

- 3.1 PREPARATION OF DOCUMENTS:
- A. General: Store record documents apart from documents used for construction and maintain documents in clean, dry, legible condition. Do not use record documents for construction purposes. Label each document "PROJECT

RECORD" in one inch or larger printed letters. Make documents available at all times for inspection by the Construction Manager.

B. Record Drawings:

1. Maintain a clean, undamaged set of blue or black line prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
2. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
3. Mark new information that is important to the Construction Manager, but was not shown on Contract Drawings or Shop Drawings.
4. Keep Record Documents current. Update at least weekly. Do not permanently conceal any work, until required information has been recorded.
5. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
6. Horizontal and vertical locations of underground irrigation and electrical sleeving, referenced to permanent surface improvements. Provide the locations of both ends identified with stakes in the field. Information to be furnished on a reproducible mylar drawing with a field log of all survey data.
7. Location of clean-outs and other items requiring access or maintenance.
8. At the completion of the project, supply a digital computer file of the record drawings and one hard copy to the Construction Manager. The Construction Manager will supply the contractor with a file of the drawings prior to beginning work.

END OF SECTION 01700

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, and other Division 1 - Specification sections, apply to Work of this section.
- 1.2 SUMMARY:
- A. Section Includes: The recording, maintenance, preparation and submittal of Project Record Documents.
- 1.3 DOCUMENTS:
- A. General
1. Store Documents in temporary field office apart from documents used for construction and maintain documents in clean, dry, legible condition. Do not use record documents for construction purposes. Label each document "PROJECT RECORD" in one inch (1") or larger printed letters.
 2. Make documents available at all times for inspection by the Owner's Representative and his Professional Consultants.
- B. Record Drawings
1. Maintain a clean, undamaged set of blue or black line prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 2. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
 3. Mark new information that is important to the Owner's Representative, but was not shown on Contract Drawings or Shop Drawings.
 4. Keep Record Documents current. Update at least weekly. Do not permanently conceal any work, until required information has been recorded.
 5. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 6. Horizontal and vertical locations of underground irrigation and electrical sleeving, referenced to permanent surface improvements. Provide the locations of both ends identified with stakes in the field. Information to be furnished on a reproducible mylar drawing with a field log of all survey data.
 7. Location of clean-outs and other items requiring access or maintenance.

8. At the completion of the project supply a digital computer file of the record drawings and one hard copy to the Owner's Representative. The Landscape Architect will supply the contractor a file of the drawings prior to beginning work.

C. Record Specifications

1. Maintain one (1) complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.
2. Upon completion of the work, submit record Specifications to the Owner's Representative for approval.

D. Record Product Data

1. Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted.
2. Upon completion of the work, submit complete set of record Product Data to the Owner's Representative for approval.

E. Record Document Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will transmit to the Owner's Representative the record documents.

F. Miscellaneous Record Submittals:

1. Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner's Representative for approval.
2. Include manufacturer's certifications, field test records, copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments, and similar documents.

- G. TRANSFER: When information for drawings is substantially complete, employ skilled drafters to transfer changes, location information and other data to a set of reproducible mylar drawings furnished by Owner's Representative. Review data and transfer and supplement with additional drawings as suited to conditions per direction of the Owner's Representative.

1.4 SUBMITTAL:

- A. Complete this work and submit as specified in Section 01700.
- B. Submit marked-up drawings prints and final product listing as part of Substantial Completion Documents.
- C. Submit completed mylar transfers as part of Final Completion Documents.
- D. Deliver record documents to Owner's Representative including all items listed above under "Documents".

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01720

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification Sections apply to this Section.
- 1.2 DESCRIPTION: Section includes general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
- 1.3 RELATED SECTIONS:
 - A. Refer to the Construction Contract and Contract Documents for terms of the Contractor's special warranty of workmanship and materials.
 - B. General closeout requirements: Section 01700.
 - C. Specific requirements for warranties for work, products and installations: Individual Sections in Divisions 2.
 - D. Certifications and other commitments and agreements for continuing services to the City: Applicable portions of Contract Documents.
- 1.4 DEFINITIONS:
 - A. Standard Product Warranties: Pre-printed written warranties published by individual manufacturers for particular products and specifically endorsed by the manufacturer to the City.
 - B. Special Warranties: Written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the City.
- 1.5 WARRANTY REQUIREMENTS:
 - A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
 - B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the City has benefited from use of the work through a portion of its anticipated useful service life.
- D. City's Recourse:
 - 1. Written warranties made to the City are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the City can enforce such other duties, obligations, rights, or remedies.
 - 2. Rejection of Warranties: The City reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
 - 3. The City reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

1.6 SUBMITTALS:

- A. Submit written warranties to the Construction Manager prior to Final Acceptance.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Construction Manager for approval prior to final execution.
- C. Refer to individual specification sections for specific content requirements, and particular requirements for submittal of special warranties.
- D. Form of Submittal: At Final Completion, compile each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier or manufacturer. Include the warranty documents in the project operating and maintenance manuals.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01740

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to Work of this Section.
- 1.2 DESCRIPTION: The work of this section consists of demolition and removal of footings, curb and pan, pavements, slabs, structures and portions of abandoned utilities. The work includes backfilling and grading.
- 1.3 RELATED SECTIONS:
 - A. Earthwork - Section 02200
 - B. Watering - Section 02233
- 1.4 SUBMITTALS:
 - A. As specified in Section 01300.
 - B. Proposed methods of building demolition.
 - C. Schedule for shutting off utility services.
- 1.4 QUALITY ASSURANCE:
 - A. Comply with safety requirements for demolition, ANSI A10.6-90.
- 1.5 PROJECT CONDITIONS:
 - A. Keep dust to a minimum at removal site and on haul roads. Use sprinklers or water trucks as necessary.
 - B. Ensure safety of persons in demolition area. Provide temporary barricades as required per Section 01500.
 - C. Explosives: Not Permitted.
- 1.6 CLOSEOUT SUBMITTALS:
 - A. As specified in Section 01700.
 - B. Submit project record drawings showing all abandoned utilities. (Hard copy and digital file).

PART 2: PRODUCTS

2.1 BACKFILL MATERIALS:

- A. Native soils, stone, gravel, or sand, free of debris, frozen materials, and roots and other organic matter. Pieces of concrete and masonry smaller than 1 square foot and suitably shaped for compaction may be used in backfill.

PART 3: EXECUTION

3.1 PREPARATION:

- A. Protect structures, utilities and vegetation to remain.

3.2 DEMOLITION:

- A. Shelters and Play Equipment: See drawings.
 - 1. Demolish structures completely. Small structures may be removed intact. Demolish larger buildings systematically, from top to ground, using hoists or derricks when necessary to lower structural framing members. Demolish concrete in small sections.
 - 2. Remove foundation walls in their entirety to the depths encountered. Completely remove below grade wood, metal, flooring, etc.
- B. Pavement and Slabs: Scarify or rip bituminous pavement; break up concrete. Saw cut material adjacent to new construction. Remove completely, including aggregate base course. Dispose of off-site.
- C. Items to be Salvaged: Signage, Memorial Bench

3.3 RESTORATION:

- A. Backfilling:
 - 1. Ensure that areas to be filled are free of standing water, frost, frozen material, and debris.
 - 2. Place backfill materials in horizontal layers not exceeding 6-inches in loose depth. Compact each layer, at optimum moisture content to a density equal to surrounding ground. Distribute concrete and masonry pieces in fill material in a way that ensures adequate compaction and at a depth that will not interfere with new construction and grading.
- B. Grading:
 - 1. Restored Areas: Grade surface to blend with original contours and provide free drainage flow.

3.4 DISPOSAL:

- A. Dispose of unsuitable and excess material off-site unless specified.
- B. The Contractor shall dispose of pavements, slabs and gravel at a recycling facility.

END OF SECTION 02050

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division-1 Specifications apply to Work of this Section.
- 1.2 DESCRIPTION: The work of this section consists of stripping sod, and removing and disposing of trees, vegetation and debris.
- 1.3 RELATED WORK:
 - A. Erosion and Sediment Control - Section 01565.

PART 2: PRODUCTS

- 2.1 BACKFILL MATERIAL: As specified in Section 02200.

PART 3: EXECUTION

- 3.1 CLEARING: Remove brush and vegetation from areas designated to be cleared. As directed by the Construction Manager, trim low hanging, unsound, or unsightly branches on trees and shrubs designated to remain. Make cuts flush with trunk or branch.
- 3.2 GRUBBING: Remove all stumps, roots, and debris a minimum of 18 inches below original ground in all areas as required. Use hand methods for grubbing inside drip line of trees to remain. Fill stump and root holes as specified in Section 02200.
- 3.3 DISPOSAL: Dispose of all removed materials, trash, debris and waste materials legally outside of the Owner's property.
- 3.4 TREE REMOVAL: In all proposed landscape areas, trees under 12" caliper shall be grubbed a minimum of 18 inches below finish grade; the stumps of trees 12" caliper and over shall be ground down a minimum of 6" below finish grade. In proposed hardscape areas, all roots shall be grubbed entirely.

END OF SECTION 02110

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division - 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists on the following:
- A. Provide excavation, regrading, strip and stockpile of topsoil, filling, backfilling, compaction and disposal of spoil materials to meet the required lines and grade as specified to complete the work. All spoil material shall be removed from the site and properly disposed of.
 - B. Erosion Control shall be maintained during all phases of site excavation and site development and maintained throughout the construction period in order to protect adjacent properties, streets, and storm sewers from erosion and sediment runoff during the construction process. Do not commence excavation and grading work until erosion control measures are in place. Contractor shall be responsible for maintaining erosion control measures throughout construction. Frequent monitoring, cleaning and other work required for proper operation shall be Contractor's responsibility. Contractor shall modify/replace all erosion control measures to fit field conditions after continual monitoring by Construction Manager.
 - C. Referenced 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 to include specifications of local agencies exercising jurisdiction over this project.
 - D. The contractor shall furnish as-built survey plans following grading operations. Plans will be required before curb and gutter, trails and other flatwork will be approved. Plans should include contours at 1' intervals.
- 1.3 RELATED SECTIONS:
- A. Removals - Section 02050.
 - B. Excavating and Backfilling of Trenches – Section 02220.
 - C. Topsoil – Section 02925.
- 1.4 DEFINITIONS:
- A. Excavation consists of removal of material encountered to subgrade or over-excavation and subsequent disposal or placement of materials removed.
 - B. All excavation will be considered unclassified regardless of the nature of material encountered.

- C. Unauthorized excavation consists of inadvertent or purposely removing materials beyond indicated sub-grade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work resulting from unauthorized excavation shall be at Contractor's expense.
- D. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- E. Subgrade: The undisturbed earth or the compacted soil layer immediately below proposed pavement topping materials.
- F. Structure: Walls, foundations, slabs, pavement or other man-made stationary features occurring above or below ground surface.
- G. Structural Fill: The term "structural fill", as used herein, includes soil materials used for general site filling under pavements or structures.
- H. Unclassified Excavation: The term "unclassified excavation", as used herein, includes the excavation of all materials required for the work obtained within construction limits of project, including bedrock, surface boulders, wasted sections of concrete, asphalt or other debris.

1.5 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with all applicable local, state and Federal rules, regulations and ordinances concerning sloping of excavation, trenching and safety of workers, including the latest version of OSHA requirements.
- B. Testing Agency: All testing required to determine compliance for the work of this section will be done by an approved testing laboratory selected and paid for by the City and as specified in Section 01400. Correct deficiencies before placing additional embankment.

1.6 PROJECT CONDITIONS:

- A. Existing Utilities: The Contractor shall contact all public utility companies and determine the location of all existing underground utilities prior to proceeding with construction. All work performed in the area of public utilities shall be performed according to the requirements of these agencies. The Contractor shall be responsible for locating any existing utility (including depth) which may conflict with the proposed construction. The Contractor shall contact Utility Notification Center of Colorado (800) 922-1987 and other local utilities for existing utility locations. The Contractor shall protect, at his own expense, all existing utilities and be responsible for their repair if they are damaged during construction.
- B. Use of Explosives: Use of explosives is not permitted.
- C. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, walkways, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

D. Environmental Requirements: Blasting is not permitted. Employ jack hammering and other loud noises and methods sparingly; comply with all applicable noise abatement ordinances or regulations. Onsite burning is not allowed.

E. Existing Benchmarks: Carefully preserve and maintain existing benchmarks, vertical/horizontal control, monuments, property line pipes and pins, and other reference points. If disturbed or destroyed, restore or replace at no additional cost to the City.

1.7 SUBMITTALS:

A. Provide one (1) cubic foot sample of backfill material for approval by Construction Manager.

B. Material classifications for soils, test reports and density requirements.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS:

A. General: All fill material, regardless of intended use category, must be clean and free from organic matter, roots, brush or other vegetation, trash, debris or other detrimental substances, and rocks or unbroken lumps larger than 3 inches. Construction Manager to approve material prior to placement.

B. Structural Fill: Existing soils obtained from on-site excavations, including granular or aggregate base course from removed pavements shall be free of organic matter or any other deleterious substances. If sufficient materials meeting the above requirements are not available from on-site sources, provide additional material obtained from off-site sources and approved by the testing and inspections agency, at no additional cost to the City. The Soils Engineer will evaluate the suitability of proposed fill material prior to placement.

2.2 ON-SITE TOPSOIL:

A. The top 4" +/- of organic material in areas to be stripped and stockpiled prior to other earthwork operations.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

- A. General: Remove material of every nature or description encountered in obtaining required lines and grades. Pitch grading around excavations to prevent water from running into excavated areas.
- B. In fill areas, the natural soils should be scarified to a depth of 8 inches, adjusted to a moisture content near optimum and compacted to provide a uniform base for fill placement.

3.2 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.

3.3 GENERAL PROCEDURES:

- A. Existing Utilities: Locate existing underground utilities in areas of the work. If utilities are to remain in-place, provide protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Construction Manager immediately for direction. Cooperate with utility companies in keeping respective permanent and temporary utility services and facilities in operation. Repair damaged utilities to the satisfaction of the appropriate utility company.
- B. Protect of Persons and Property: Provide all necessary measures to protect workmen and passerby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.

3.4 GROUND SURFACE PREPARATION:

- A. Complete clearing and grubbing operations in accordance with Section 02110. Where new material is to be placed on compacted subgrade, scarify ground surface until surface is free from ruts, hummocks or other uneven features, which would prevent uniform compaction and bond between old and new material.
- B. Prior to placing asphalt or concrete pavement, the entire subgrade shall be scarified to a depth of 8 inches. Adjust moisture content and compact as hereinafter specified.

3.5 STRIPPING AND STOCKPILING TOPSOIL:

- A. Strip all topsoil from the excavation zone for new facilities (4" depth for all disturbed areas). Stockpile topsoil in locations indicated on the Drawings or as directed by the Construction Manager.

3.6 EXCAVATION:

- A. All excavation shall be considered unclassified, including excavation to subgrade or trench elevations as indicated, regardless of character of materials and obstructions encountered.
- B. Stability of excavations: Comply with local codes, ordinances, and requirements of agencies having jurisdiction to include the latest revision to OSHA standards.
- C. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.08 foot, and extending a sufficient distance to permit installation of services, and other construction and for inspection.
- D. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as indicated within a tolerance of plus or minus 0.1 foot.

3.7 DEWATERING:

- A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

3.8 SPECIAL CONDITIONS:

- A. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- B. Dust Control: Provide dust control to alleviate dust nuisance to the public, to adjacent properties and other work underway at the project site.
- C. Unanticipated Conditions: Notify the Construction Manager immediately upon finding subsurface or other conditions which are not shown or which cannot be reasonably assumed from existing surveys. Secure Construction Manager's instructions before proceeding with further work in such areas.
- D. Unsatisfactory Soils: Remove or otherwise correct unsanitary, sour, or otherwise unsatisfactory soil. Remove contaminated or unsuitable material from under paved areas.
- E. Additional Excavation: When excavation has reached required subgrade elevations, notify the City's testing agency, which will make an observation of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the testing agency.

3.9 FILL AND BACKFILL:

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.
 2. Under walks and pavements, use satisfactory excavated or borrow materials, or a combination to meet structural fill requirements.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
 2. Removal of all trash and debris from excavation.

3.10 PLACEMENT AND COMPACTION:

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
1. When existing ground surface after vibratory process has a density less than required compaction for a particular area classification, break up ground surface. Scarify existing subgrade to depth of 6 inches prior to compacting and placing fill.
 2. Adjust moisture condition to Soils Engineer's recommendations regarding optimum moisture content, and recompact to the densities specified in Paragraph 3.10L.
- B. Place backfill and fill 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, each layer to be compacted to meet requirements herein.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- D. Compaction of Fill for Hardscape Areas: Select fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted. Fill materials shall be placed such that the thickness of loose material does not exceed 8 inches and the compacted lift thickness does not exceed 6 inches.
- E. Compaction, as specified above, shall be obtained by the use of sheepfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Construction Manager. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Construction Manager. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient passes to ensure that the required density is obtained.

- F. **Compaction of Landscape Slope Areas:** Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and there is not appreciable amount of loose soils on the slopes. Compaction of slopes may be done progressively in increments of three to five feet (3' to 5') in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 4:1 (horizontal to vertical).
1. Where natural slopes are steeper than 20 percent in grade and the placement of fill is required, cut benches shall be provided at the rate of one bench for each 5 feet in height (minimum of two benches). Benches shall be at least 10 feet in width. Larger bench widths may be required by the Construction Manager. Fill shall be placed on completed benches as outlined within this specification.
- G. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- H. Control soil and fill compaction, providing minimum percentage of density specified. Correct improperly compacted areas or lifts as directed if soil density tests indicate inadequate compaction.
- I. **Moisture Control:** Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
1. **Moisture Content:** The Contractor may be required to add moisture to the excavation materials in the stockpile area if, in the opinion of the Construction Manager, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rake or disc the fill soils to provide uniform moisture content through the soils.
 2. The application of water to the embankment materials shall be made with any type of watering equipment approved by the Construction Manager, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.
 3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 4. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
- K. Prior to placement of any base or surfacing materials, 100% of the subgrade shall be proof rolled with a fully loaded tandem-axle truck.
- L. **Density Tests:** Field density tests shall be made by the City testing laboratory at locations and depths selected by the Construction Manager. Where sheepsfoot

rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate that the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

1. Acceptance Criteria under pavements and structures: Intervals and quantities of tests required shall be established by the Soils Engineer and approved by the Construction Manager. On-site or imported clay materials shall be compacted to at least 95 percent of maximum standard Proctor dry density (ASTM D 698) at moisture content within 2 percent of optimum. Granular material, whether imported or developed on-site, shall be moisture conditioned to within 2 percent of optimum and compacted to at least 95 percent of maximum modified Proctor dry density (ASTM D 1557).
2. Under landscape areas: 85 percent of maximum standard Proctor dry density at moisture content within 2 percent of optimum (ASTM D 698).

3.11 GRADING:

- A. General: Uniformly grade areas within project limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations or contours are indicated or between such points and existing grades.
- B. Finish surfaces free from irregular surface changes and as follows:
 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
 2. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 0.02 feet above or below required subgrade elevation.
- C. Under no circumstances shall variations from specified grade elevations create any ponding or retention of water on intermediate pavement levels, or finished surfaces.

3.12 PLACING STOCKPILED TOPSOIL:

- A. Refer to Section 02925.

3.13 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Removal from Owner's Property: Remove waste materials, including materials not allowed for fill, backfill or site grading as specified within, trash, and debris, and dispose of it off Owner's property at Contractor's expense.
- B. Remove any excess fill material from the site, unless otherwise directed by the Construction Manager.

END OF SECTION 02200

SECTION 02220 EXCAVATING, BACKFILLING & COMPACTING FOR UTILITY SYSTEMS

PART 1 GENERAL

- 1.1 DESCRIPTION: The work of this Section consists of excavation and backfilling for utility systems, complete-in-place, as shown on the plans specified herein. The cost of the work shall be included in other sections.
- 1.2 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, and Division – 1 Specification section, apply to Work of this section.
- 1.3 RELATED WORK:
 - A. Earthwork – Section 02200.
- 1.4 QUALITY ASSURANCE:
 - A. Applicable Standards: Apply the current or latest editions of the standards described below:
 1. ASTM - American Society for Testing and Materials
 2. AASHTO - American Association of State Highway Officials
 - B. Comply with Division 1 requirements
 - C. Comply with all requirements of agencies exercising jurisdiction over the project. The Contractor's attention is directed to the requirements of section 3.03 below.
- 1.5 PROJECT CONDITIONS:
 - A. Protection and Maintenance of Existing Improvements:
 1. Furnish, place, and maintain all shoring and bracing or sheet piling as per the Occupational Safety and Health Administration, Publication 29 CFR Part 1926 which may be required for the sides of the excavation or for protection of adjacent existing improvements. The adequacy of such systems shall be the complete responsibility of the Contractor.
 2. Provide protection necessary to prevent damage to existing improvements indicated to remain in place. Provide necessary fencing or barricades. Protect all improvements on adjoining properties and on Owner's property. Restore damage improvements to their original condition, as acceptable to Property Owners, or Authorities having jurisdiction.
 3. Assessment of damages shall be by the Owner's Representative and all replacement and repair to be to the Owner's Representative's satisfaction. Cost of replacement of all damaged improvements to be borne by the Contractor.

- B. Construction Traffic: Conduct construction operations to ensure minimum interference with roads, streets, walks, trails and other adjacent occupied or used facilities to include adjacent project areas or temporary access. Do not close or obstruct streets, walks, trails or other occupied or used facilities without permission from authorities having jurisdiction.

1.6 LAYOUT AND SURVEY:

- A. The Contractor shall engage the services of an Engineer or Surveyor to establish and verify all lines, grades and levels necessary to construct the work. The costs of all surveys and construction staking is the responsibility of the Contractor.
- B. Discrepancies: Any errors, inconsistencies or omissions shall be brought to the attention of the Owner's Representative, immediately, prior to proceeding with work.

1.7 SITE MAINTENANCE:

- A. Standing Water:
 - 1. Keep site free of standing water at all times. Provide and maintain grading or pumping as necessary to prevent erosion, softening of compacted surfaces and formation of mud in trenches and excavation.
 - 2. Run all surface or subsurface seepage encountered to temporary sumps located where required or directed. From the sumps, pump water out and legally dispose of in a manner that will keep the entire site in workable condition at all times.

PART 2 PRODUCTS

2.1 FILLS:

- A. General:
 - 1. All soil materials shall comply with Section 02200 - Earthwork.
- B. Imported Fill:
 - 1. Non-expansive, predominantly granular soil, free from organic matter, deleterious substances, and not containing materials over 3 inches in greatest dimension.
- C. Stockpiling: Material accepted for filling and backfilling may be stockpiled on site at locations acceptable to the Owner's Representative.

2.2 SHORING AND BRACING:

- A. The Contractor shall be responsible for the proper design, installation, use, maintenance and removal of all materials and equipment necessary to properly brace trenches per the Occupational Safety and Health Administration, Publication 29 CFR Part 1926. The Contractor shall provide additional shoring or bracing measures in addition to the referenced publication requirements as may be necessary to ensure the safety of the work area.

PART 3 EXECUTION

3.1 EXCAVATION:

A. General:

1. Excavate for structures, conduits and pipes to elevations and dimensions shown on plans. Extend excavation a sufficient distance from structure foundations to permit placing and removal of formwork, installation of materials, services, and inspection. Hand trim foundation excavations to final grade just before concrete is placed. Remove loose, soft materials, and all organic matter. Foundations shall bear on approved undisturbed bearing soil or compacted fill material. Owner will not pay for excavations carried below indicated grades without prior written authorization.
2. Excavate for manholes and pipes to elevations and grades indicated on plans. Allow for necessary base material.
3. Earth excavation shall include the satisfactory removal and disposal of all materials encountered, regardless of the nature of the materials, the condition of the materials at the time they are excavated, or the manner in which they were excavated.
4. Contractor shall remove all existing paving, walks, curbs and vegetation necessary for the execution of these plans to the satisfaction of the Owner's Representative and dispose of properly off-site.
5. All materials to be excavated shall be unclassified and shall include earth fills, gravels, and other materials encountered.

- B. Earth Forms: Concrete may be poured against vertical excavated surfaces provided the material will stand without caving, and provided that minimum reinforcing steel clearances indicated on Drawings are maintained, and suitable provisions are taken to prevent raveling of top edges.

- C. Wood Forms: Pour excavated width of concrete section as shown on Drawings. Excavation for formed concrete shall be of sufficient width to allow for convenient construction and removal of forms.

3.2 EXCESS EXCAVATED MATERIAL:

- A. Unsuitable Material: Legally dispose of all materials determined unsuitable for use as fills or topsoil.

- B. Unauthorized Excavation: Where unauthorized excavations are made below indicated elevations, restore to proper elevations as specified for compacted backfilling. (See Section 02200 – 3.02 – A.)
- C. No additional payments shall be made for unauthorized excavation nor for all labor and materials necessary to correct such work.

3.3 PLACEMENT OF FILLS:

- A. Spreading:
 - 1. Spread fill material in uniform lifts of not more than 8 inches in uncompacted thickness.
 - 2. Fill material shall be moisture conditioned to within 2% above or below the optimum moisture content to permit proper compaction.
 - 3. All backfill materials including pipe bedding materials shall be compacted to 90% of maximum dry density within $\pm 2\%$ of optimum moisture content or 70% of maximum relative density. All backfill within 2 ft. of finished subgrade under paved surfaces and with 2 ft. of finish grade in unpaved areas shall be compacted to 95% of maximum dry density within $\pm 2\%$ of the optimum moisture content. Local utility agencies or governing jurisdictions that permit placement of bedding and other backfill materials around or over the pipe without compaction does not relieve the Contractor from meeting these compaction requirements. Testing of pipe bedding material shall constitute not less than 15% of the total number of compaction tests taken on backfill materials within the trench.
 - 4. Suspend fill operations when satisfactory results cannot be obtained because of environmental or other unsatisfactory site conditions. Do not use muddy or frozen subgrade surface. Do not place fill material on muddy or frozen subgrade surface.
 - 5. Topsoil or other organic materials are not permitted as fill or backfill material.
- B. Precaution: Do not drop fill on any structure. Do not place backfill around, against, or upon any concrete structure until structure has attained sufficient strength to withstand the loads imposed.
- C. Backfilling, Prior to Approval: Do not allow or use any of the work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests, and approvals. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner. After the work has been completely tested, inspected, and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of the uncovering, all at no additional cost to the Owner.
- D. Maintain surface conditions which permit adequate drainage of rain water and prevent ponding of surface water in pockets. When fill placement is interrupted by rain, remove wet surface materials or permit to dry before placing additional fill material.

3.4 EXISTING UTILITIES:

- A. Notification: Where unmarked utility lines or other underground obstructions or piping may be uncovered within the work area, notify the Owner, the agencies or service utility companies having jurisdiction thereof, and take necessary measures to prevent interruption of service.
- B. Damage or Interruption: Should such lines or services be damaged, broken, or interrupted through the Contractor's own negligence, immediately repair and restore at no additional expense to the Owner.

3.5 COMPACTION:

- A. Compact all trenches and excavations for related appurtenances for the full width and depth excavated.
- B. Equipment: Use compacting rollers, pneumatic or vibratory compactors, or other equipment and methods approved by the Owner's Representative.

3.6 TESTING:

- A. Supervision: All excavation, backfilling, and compaction shall be randomly tested by the Contractor. The Owner's Representative reserves the right to increase the testing requirements. Sufficient testing shall be provided to satisfy the requirements of the local authorities exercising jurisdiction over the project.
- B. Density:
 - 1. Standards: Per ASTM or AASHTO test methods where fill, backfill, or in-place materials are required to be compacted to a specified density. The results of these tests shall be the basis upon which satisfactory completion of work will be judged. Comply with compaction requirements required by the Geotechnical Report or the provisions of Item 3.03-A-3 above whichever requires the greater percent of compaction.
 - 2. Intervals: For each 400 LF of trench or portion thereof test at intervals not exceeding 3 feet of fill height. Not less than two tests shall be made at each manhole, inlet, cleanout or similar structure. Testing of pipe bedding material shall constitute not less than 15% of the total number of compaction tests taken within the trench.
 - 3. Unacceptable Installations: Any area or portion thereof that does not meet minimum density requirements shall be reworked and recompacted until it meets the project density requirements. The cost to make all installations acceptable will be borne by Contractor at no additional cost to Owner. Retest reworked areas as specified herein.

4. Fees for Additional Testing: Fees for all additional testing made necessary by inadequate compaction, replacement of unacceptable material, or other work not complying with the Drawings and Specifications, will be borne by the Contractor at no additional cost to the owner.

3.7 STREET AND TRAIL REPAIR:

When construction requires trenching in existing asphalt paved streets or ex-paved path or trail, repair shall conform to City Standards, latest version.

3.8 CLEAN UP:

- A. Keep all areas of work clean, neat and orderly at all times.
- B. Upon completion of work, remove off the site all surplus materials, tools, equipment, rubbish and debris resulting from the work.

END OF SECTION 02220

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division-1 Specification sections apply to Work of this Section.
- 1.2 DESCRIPTION: The work of this section consists of removing and disposing of trees.

PART 2: PRODUCTS

- 2.1 TREE PAINT:
 - A. Approved asphalt base paint prepared especially for tree surgery.
- 2.2 BACKFILL MATERIAL:
 - A. Site backfill and grading as specified in Section 02200.

PART 3: EXECUTION

- 3.1 PROTECTION OF TREES AND PLANTS TO REMAIN:
 - A. Refer to plans.
- 3.2 TREE REMOVAL:
 - A. Remove trees designated to be cleared. As directed, trim low hanging, unsound, or unsightly branches on trees and shrubs designated to remain. Make cuts flush with trunk or branch. Paint cuts larger than ½-inch in diameter with tree paint.
- 3.3 GRUBBING:
 - A. Remove all stumps, roots, and debris a minimum of 6-inches below original ground. Use hand methods for grubbing inside drip line of trees to remain. Fill stump and root holes as specified in Section 02110.
 - B. Stumps within the critical root zones of remaining trees shall be flush-cut and ground down to a minimum of 6-inches below original ground, as directed by Owner.
- 3.4 DISPOSAL:
 - A. Dispose of debris and excess material off site.

END OF SECTION 02230

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division – 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of furnishing and placing crushed aggregate, bonded with fine aggregate, constructed on a prepared underlying course in accordance with these specifications and in conformity with the dimensions, typical cross section, and the lines and grades shown on the Drawings. The locations where aggregate base course will be used are shown on the Drawings.
- 1.3 RELATED SECTIONS:
 - A. Earthwork – Section 02200.
 - B. Asphalt Pavement – Section 02745

PART 2: PRODUCTS

- 2.1 AGGREGATE BASE COURSE: Base course material consisting of hard, durable particles or fragments of stone or gravel mixed or blended with sand, clay, stone dust, or other similar binding or filler materials produced from approved sources to provide a uniform mixture complying with the requirements, and capability of being compacted into a dense and well-bonded base. All oversize (1 ½ inches of Class 5 and ¾ inch for Class 6) stone, rock, and boulders occurring in the pit or quarry material shall be screened out or removed and wasted; those of acceptable quality may be crushed and become a part of the base material, provided the blend meets the specification gradations. The aggregate shall be free from vegetable matter, loam, lumps, or excessive amounts of clay and other objectionable or foreign substances. All stones, rocks, and boulders of inferior quality occurring in the pit shall be separated out and wasted. The course aggregate shall have a percent of wear of not more than 50 to 500 revolutions as determined by AASHTO Test T-96. The gradation of the processed or unprocessed material shall meet the requirements of Item 703.03 of the Standard Specifications for Road and Bridge Construction of the Colorado Department of Highways, latest revision for Class 5 or Class 6.
- 2.2 AGGREGATE: The use of this term implies the use of Aggregate Base Course.

PART 3: EXECUTION

- 3.1 EQUIPMENT: All equipment necessary for the proper construction of this work shall be on the project, in first class working condition, and shall have been approved by the Construction Manager before construction is permitted to start.
- 3.2 PREPARING UNDERLYING SUBGRADE: The underlying course shall be checked and accepted by the Construction Manager before placing and spreading operations are started.

3.3 METHOD OF SPREADING:

- A. The aggregate material shall be placed on the prepared underlying course and compacted in layers not to exceed 6 inches in depth. The depositing and spreading of material shall commence where designated and shall progress continuously without breaks. The material shall be deposited and spread in a uniform layer and without segregation of size. The layer will have the required thickness.
- B. The aggregate spread shall be of uniform grading with no pockets of fine or course materials. During the spreading process, sufficient caution shall be exercised to prevent the incorporation of underlying materials in the aggregate.

3.4 PROTECTION: Work on the aggregate shall not be prosecuted during freezing temperature. When the aggregates contain frozen material or the underlying course is frozen, the construction shall be stopped.

3.5 MAINTENANCE: Following the completion of the base course, the Contractor shall perform all maintenance work necessary to keep the aggregate in a satisfactory condition until acceptance of the project. The surface shall be kept clean and free from foreign material. The base course shall be properly drained at all times. Any work or restitution necessary shall be performed at the expense of the Contractor.

END OF SECTION 02232

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division - 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of furnishing, hauling, and applying water required for compaction of embankments, backfills, subgrade, and for landscaping, dust control, and other construction operations.
- 1.3 RELATED SECTIONS:
 - A. Earthwork – Section 02200.
 - B. Turfgrass Seeding – Section 02932.
 - C. Native Seeding – Section 02933.
 - D. Trees and Shrubs – Section 02950.

PART 2: PRODUCTS

- 2.1 WATER: Free of debris, organic matter, and other objectionable substances. Coordinate with Construction Manager for water supply location. Contractor shall supply water meter to measure water usage and be responsible to pay all costs related to water usage. The cost of water shall be the same amount as charged to the City.

PART 3: EXECUTION

- 3.1 WATER TRUCK:
 - A. At least 1,000 gallon capacity.
 - B. Keep at least one water truck on site when directed by Construction Manager.
- 3.2 APPLICATION: Use pressure type distributors or a pipeline equipped with sprinkler system. Provide approved meter devices near points of discharge.
 - A. Ensure a uniform application of water for optimum moisture content. Avoid excessive runoff and minimize water waste.
 - B. The Contractor may water excavation areas before excavating. Drill full depth of excavation to make moisture determinations.
 - C. If overwatering occurs, de-water at no additional expense to the City.

END OF SECTION 02233

PART 1: GENERAL

1-1 DESCRIPTION: The work of this section consists of installation of water control measures, excavation and backfill as required, subgrade preparation, materials and installation of bedding and rock riprap as indicated herein and on the Drawings.

1-2 SUBMITTALS AND TESTING: In accordance with Section 01300, submit certificate stating both source of stone and certifying materials for all types of rock will meet the requirements of this section. Include test results for specific gravity, abrasion, gradation and freeze thaw on samples of rock to be supplied on this project.

Prior to beginning construction, the Engineer shall determine if a field inspection of the quarry is necessary. In advance of delivery of rock to the work site, such inspection of the quarry shall be arranged by the Contractor and shall include the Contractor, Engineer, and Quarry Representative. The quarry will identify the rock source and procedures that will be used to stockpile, mix and grade the types of riprap and boulders specified.

1-3 RELATED WORK SPECIFIED ELSEWHERE: Excavation, Trenching and Site Earthwork - Section 02221; Water Control and Dewatering - Section 02530; Erosion Control - Section 02540; Cast-in-Place Concrete - Section 03300.

PART 2: MATERIALS

2-1 ROCK

A. GENERAL: Use quarry rock that is sound and durable against disintegration under conditions to be met in handling and placing, and is hard and tenacious and otherwise of a suitable quality to ensure permanency in the specified kind of work.

All rock shall be angular, each piece having its greatest dimensions not greater than 3 times its least dimensions and shall conform to the following test requirements of the American Society for Testing Materials Standards:

	<u>Requirement</u>	<u>ASTM Standard</u>
Apparent specific gravity, minimum	2.60	C-127-59
Abrasion, maximum percent	40	C-535-69
Freeze thaw loss, maximum percent after 12 cycles	10	AASHTO 103 Procedure A

All rock to be used on the project must be approved by the Engineer. There is no specific color requirement for the rock. However, once approved, the rock shall be kept consistent through the project. No change may be made to the rock source unless specifically approved by the Engineer.

B. RIPRAP: Concrete masonry or concrete pavement may not be used for riprap. The gradation requirements for ordinary riprap shall be as follows (approximate weight assumes spherical shape which more closely approximates the weight of the individual stone):

CLASSIFICATION AND GRADATION OF ORDINARY RIPRAP

<u>Riprap Designation</u>	<u>% Smaller Than Given Size By Weight</u>	<u>Intermediate Rock Dimension (Inches)</u>	<u>Approximate¹ Min. Rock Weight (Pounds)</u>	<u>d₅₀[*] (Inches)</u>
Type VL**	70-100	12	85	6
	50-70	9	36	
	35-50	6	11	
	2-10	2	0.4	
Type L**	70-100	15	166	9
	50-70	12	85	
	35-50	9	36	
	2-10	3	1.3	
Type M	70-100	21	455	12
	50-70	18	287	
	35-50	12	85	
	2-10	4	3	
Type H	100	30	1,327	18
	50-70	24	680	
	35-50	18	287	
	2-10	6	11	
Type VH	100	42	3,642	24
	50-70	33	1,767	
	35-50	24	680	
	2-10	9	36	

Based on Specific Gravity = 2.60; *d₅₀ = Mean particle size; ** Bury types VL and L with 6 inches top soil and revegetate to protect from vandalism (other types of riprap may be buried if noted on the plans).

Unless otherwise noted on the Drawings, riprap shall be placed in the following minimum thicknesses (not including bedding thickness):

<u>Riprap Designation</u>	<u>Riprap Layer Thickness (inches)</u>
Type VL	12
Type L	16
Type M	21
Type H	30
Type VH	42

C. BOULDERS: Boulders shall consist of rock meeting the requirements specified in this section with the minimum size of the boulders in any dimension being the boulder size called out on the Drawings. No boulder shall have any one dimension greater than 2 times its minimum specified dimension. Boulders to be grouted must be free of material that would affect the grout bond.

D. **QUALITY CONTROL:** The Contractor shall manage the delivery and stockpiling of rock at the site to assure that adequate supply of rock meeting the specification is available for installation when required. Stockpile locations shall be arranged to avoid interference with other project operations. Rock that does not meet specifications or is not installed shall be removed from the site.

2-2 **BEDDING:** Use free-draining material consisting of sand, gravel, or crushed stone. All materials shall meet the following gradation requirements:

GRANULAR BEDDING GRADATION

U.S. Standard <u>Sieve Size</u>	Percent by Weight Passing Square	
	Type I	Type II
3-inch	-	100
12-inch	-	-
24-inch	-	20-90
48-inch	100	-
No. 4	95-100	0-20
No. 16	45-80	-
No. 50	10-30	-
No. 100	2-10	-
No. 200	0-2	0-3

2-3 **FOUNDATION STABILIZATION MATERIAL:** Material for foundation stabilization beneath the path or other structures as noted shall be rock of the size and gradation indicated on the drawings. Thickness of rock stabilization material shall be as specified on the drawings. Refer to Section 02530 for water control and dewatering.

PART 3: EXECUTION

3-1 **SUBGRADE PREPARATION:**

A. **WATER CONTROL:** Prior to commencing work on boulder and riprap placement, install water control measures as required to perform work in dry conditions. Water control measures shall include, but are not limited to, diversions, sumps with pumps or other means necessary to maintain the level of groundwater below subgrade elevation and to divert surface water away from the work area. The Contractor is responsible for investigating and familiarizing himself with respect to all site conditions that may affect the work, including surface water, level of groundwater and time of year the work is to be done. By submitting a bid, the Contractor acknowledges that such investigations have been made and consideration of such conditions are a part of his bid. Refer to Section 02530.

B. **SUBGRADE PREPARATION FOR RIPRAP AND BEDDING MATERIAL:** Excavate for placement of rock as indicated, providing a firm smooth uniform surface at the proper grade. The subgrade shall be compacted to 95 percent maximum density (ASTM D698) or to 70 percent of its maximum relative density (ASTM D2049). In fill areas, after removal of topsoil and any soft yielding material, place approved on-site material and compact as specified herein to the designated subgrade elevation. Subgrade elevation and compaction

shall be verified by the Owner's Representative prior to placement of riprap. Refer to Section 02221 for removal and replacement of unsuitable material.

3-2 TYPE I AND TYPE II BEDDING PLACEMENT: Install bedding material in accordance with the following requirements, unless otherwise designed on the Drawings.

Riprap <u>Type</u>	Minimum Bedding Thickness (Inches)				
	Fine Grained Soils			Coarse Grained Soils*	
	<u>Type I</u>		<u>Type II Total</u>		<u>Type II</u>
VL, L	4	+	4 = 8		6
M	4	+	4 = 8		6
H	4	+	6 = 10		8
VH	4	+	6 = 10		8

* 50% or more by weight retained on the #40 sieve.

At the Contractor's option a 12-inch layer of Type II bedding may be substituted for the combination layer of Type I and Type II bedding over in-situ fine grained soils.

3-3 RIPRAP: Prepare subgrade and place bedding where required as specified herein. Machine-place stones into position following details indicated. Arrange as necessary by use of a multi-prong grapple device or hand to interlock. Dumping and/or backhoe placement alone is not sufficient to ensure proper interlocked placement. The basic procedure shall result in larger materials flush to the top surface with faces and shapes matched to minimize voids. Surface grades will be a plane or as indicated, but projections above or depressions under the finished design grade more than 10% of the rock layer thickness will not be allowed. Voids will be filled completely with a well graded mixture of the remaining material that is securely locked between the larger stone. It is essential that the material between the larger stones not be loose, or easily displaced by flow or by vandalism. The remaining stone will also be used to provide a subgrade that will achieve the proper grade for the surface stone. The stone will be consolidated by the bucket of the backhoe or other means that will cause interlocking of the material. The stream side of the riprap is to be uniform and free from bulges, humps, or cavities. All rock is to be placed in a dewatered condition beginning at the toe of the slope or other lowest point.

END OF SECTION

SECTION 02520 CONCRETE WALKS, CURBS AND MISCELLANEOUS FLATWORK

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of constructing concrete walks, curb and gutters, ramps, pans and sawcut/ stained/ sealed color ribbons.
- 1.3 RELATED SECTIONS:
 - A. Earthwork – Section 02200.
 - B. Aggregate Base – Section 02232.
 - C. Cast-In-Place Concrete - Section 03300.
- 1.4 SUBMITTALS: As specified in Section 01300.
 - A. In compliance with Paragraph 5.3.2 of ASTM C94, furnish statement of composition of concrete mix and ad mixtures and evidence that mix meets specified quality.
 - B. Test reports as indicated below.
 - C. Manufacturer stain color samples of specified colors.
- 1.5 QUALITY ASSURANCE:
 - A. Strength testing shall be the responsibility of the City.
 - B. Sample Panel: If requested by the Construction Manager prior to starting concrete paving, provide a sample panel using materials indicated for project work. Build panel at the site of full thickness and approximately 10 feet by 10 feet, including expansion joints, control joint, scales, fillers, etc. Provide the workmanship proposed for the work. Correct and replace sample panel until Construction Manager's acceptance of the work. Retain panel during construction as a standard for completed paving work.
 1. The approved sample panel may be a portion of the work and remain in place. Locations as directed by the Construction Manager.
- 1.6 PROJECT CONDITIONS: Place concrete only when ambient air temperatures are above 45 degrees F and rising, unless it is protected from freezing. Do not place concrete on frozen ground.

- 1.7 TRAFFIC CONTROL: Contractor shall maintain safe and continuous flow of traffic in streets and access to private property at all times. The Contractor shall provide a safe roadway by erecting and maintaining standard advance warning signs, barricades and adequate safeguards around all excavations, embankments and obstructions. The Contractor shall provide suitable warning lights for night operation or any other time when visibility is limited. The Contractor shall further provide flagmen and/or uniformed police officers as may be determined by the City for the protection of the public. The Contractor shall coordinate his operations with the City in order that approved methods which meet City Standards are used in detouring traffic flow, parking, pedestrian flow, access to private property. See Section 01500 – Construction Facilities and Temporary Controls.

PART 2: PRODUCTS

- 2.1 SUBGRADE MATERIAL: Dense, readily compactible material, free from vegetable matter and lumps of clay. Material excavated from on-site that meets this requirement may be used if approved. See Section 02200.
- 2.2 CONCRETE:
- A. Materials: Materials, including cement, aggregates, water, and admixtures, shall meet the requirements of ASTM C94-90. Refer to Section 03300 for additional materials and requirements.
 - 1. Cement: Type II.
 - 2. Coarse Aggregate: Maximum size, 3/4 inch complying with ASTM C33-90.
 - 3. Water: Potable
 - 4. Air Entraining Admixture: ASTM C260-86. No chlorides will be permitted.
 - 5. Water Reducing Admixture: ASTM C494-86 Type A. Provide for all flatwork. No chlorides will be permitted.
 - B. Quality of Concrete: Concrete shall be furnished under Option C, ASTM C94-90, whereby the manufacturer assumes full responsibility for the selection of the proportions for the concrete mixture. Submit statement of composition as called for in Part 1 of this section.
 - C. Total Average Air Content: 5 to 7 percent.
 - D. Minimum Cement Content: 6 sacks per cubic yard.
 - E. Water Cement Ratio: Max. (.48 ±).
 - F. Slump: Maximum 4 inches.
 - G. Compressive Strength: 4,000 PSI minimum at twenty-eight days.
 - H. Manufacture and Delivery: Measurement of materials, batching, mixing, transporting, and delivery shall be as specified in ASTM C94-90. Discharge

concrete into forms within 1-1/2 hours after introduction of water to cement. When temperature of concrete is 85 degrees F or above, the time between introduction of water to cement and complete discharge of concrete into forms shall not exceed 45 minutes.

- 2.3 FIBROUS CONCRETE REINFORCEMENT: Provide fibrous concrete reinforcement for all flatwork, consisting of 100% virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation utilizing 25 individual fiber designs for use as concrete secondary reinforcement. Volume per cubic yard shall equal a minimum of 0.1% (1.5 pounds). Fiber manufacturer must document evidence of 5 year satisfactory performance history, compliance with applicable building codes and ASTM C1116 Type III 4.1.3 and ASTM C1116 Performance Level I. Acceptable manufacturer: Fibermesh Company, 4019 Industry Drive, Chattanooga, Tennessee, USA, 37416 or approved equal.
- 2.4 EXPANSION JOINT FILLERS: Pre-molded closed cell polyethylene foam, equal to "Sonoflex F" by Sonneborn, Minneapolis, Minnesota. Provide ½-inch thick by depth of the slab material, allow ½ thickness for joint sealer.
- 2.5 EXPANSION JOINT SEALER : Silicone sealant material, available from CDOT's pre-approved list of manufacturers. Where color additive is used, color to match.
- 2.6 CURING COMPOUND: Clear Spray Applied Membrane Forming Liquid conforming to ASTM C309-81, Type 1. Curing Compound shall not reduce bonding or adhesion of finish materials applied to concrete surfaces.

PART 3: EXECUTION

- 3.1 PREPARATION OF SUBGRADE: Excavate to required depth. Remove soft, yielding material and replace with select fill. Compact in accordance with requirements of Section 02200.
- 3.2 MAINTENANCE OF SUBGRADE: Maintain subgrade in a compacted condition until concrete is placed.
- 3.3 FORMS: Metal or uniform warp free lumber, coated with form release agent. Slope forms to give slabs positive drainage and stake securely. Obtain approval of Construction Manager for alignment and grade before placing concrete. Radii shall be continuous and flowing to avoid angular intersections in the horizontal alignment.
- 3.4 PLACING:
 - A. Concrete shall be formed, placed, vibrated and finished by hand using conventional methods. Concrete shall be placed at the line and grade shown on plans.
 - B. Place concrete on moistened subgrade monolithically between construction joints. Deposit to full depth in one operation. Consolidate immediately. After depositing concrete, screed and darby or bullfloat.

3.5 CONCRETE FINISHING:

- A. After darbying or bullfloating, stop finishing until bleeding has ceased and until concrete can support foot pressure with only about 1/8-inch indentation. During or after the first floating, check planeness of surface with a 10-foot straightedge applied at not less than two different angles, and then cut down all high spots and fill all low spots to achieve a true plane within 1/8 inch in 10 feet.
- B. Refloat slab immediately to a uniform sandy texture. Use steel trowel to densify surface, then apply medium broom finish to slab perpendicular to line of traffic.

3.6 FORM REMOVAL: Remove forms after concrete surface is hard enough so as not to be injured in any way. Reasonable care is to be used in removing forms. Repair minor defects with mortar. Plastering will not be permitted on exposed faces.

3.7 JOINTS: Construct joints true to line with faces perpendicular to surface.

- A. Expansion Joints: Expansion joint material shall be provided at the following locations and shall be in place prior to the placing of concrete: 1) at each end of curb return; 2) between sidewalk and driveway slabs or service walks; 3) between new concrete and existing concrete; 4) as shown on the plans; 5) between new concrete and fixed vertical objects, or 6) as directed by the Construction Manager.
- B. Contraction (Control) Joints in Walks: Contraction joints shall be formed with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete that has hardened sufficiently that cutting action will not tear, abrade, or otherwise damage surface, but before development of random contraction cracks. Saw cut joints shall be spaced at a distance equal to the width of the walk and to a depth of one-fourth the slab thickness. Tooled joints will not be allowed on concrete trails, unless directed by the Construction Manager.
- C. Joints in Handicap Ramps: Joints in handicap ramps shall be heavily tooled in a 12" x 12" pattern in accordance with standard City details.
- D. Curb and Gutter Contraction (Control) Joints: Space curb and gutter joints not more than 12 feet 6 inches on center, and align them with sidewalk joints. Contraction joints shall be tooled. Form plane of weakness by inserting and later removing a metal divider, finish with an edger or groover, or by saw cutting a previously tooled joint.
- E. Sawcut "Ribbon" Joint: Contractor to handcut smooth and continuous sawcut joints of ribbon edges as shown on drawings.

- 3.8 CURING: Thoroughly cure and protect concrete by keeping the surface moist for 7 calendar days or by use of curing compound applied in accordance with manufacturer's written instructions. Cure slabs with integral color in accordance with instructions of the pigment manufacturer using a pigmented membrane-forming curing compound with integral color to match concrete pigment. On exposed slabs with integral color, do not use polyethylene or paper sheeting.
- 3.9 FIELD QUALITY CONTROL: Surfaces shall not vary more than 1/8-inch when tested with a 10 foot straightedge.

END OF SECTION 02520

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division – 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of installing asphaltic pavement as shown and as specified.
- 1.3 RELATED SECTIONS:
 - A. Earthwork – Section 02200.
 - B. Concrete Walks, Curbs and Miscellaneous Flatwork – Section 02520.
 - C. Cast-in-Place Concrete – Section 03300
- 1.4 SUBMITTALS:
 - A. Mix Design: Submit job-mix formula for aggregate and bitumen content for review. Job-mix formula shall have been derived from tests performed by a qualified testing laboratory. Results of previous tests performed on aggregates from same source and using asphaltic material of same brand as used in a previous mix design may be used with approval of the Owner's Representative.
 - B. Test Reports: Submit reports for laboratory and field tests required under "Testing" article.
 - C. Make submittals in accordance with Section 01300.
- 1.5 QUALITY CONTROL:
 - A. Contractor shall maintain a quality control program in accordance with CDOT standard specifications to ensure that the asphalt produced meets the job-mix design, but documentation submittals are not required. Owner will not provide mix verification testing.
- 1.6 TESTING:
 - A. Base Course: Contractor shall arrange and pay for base course compaction testing by a qualified testing agency, acceptable to the City and independent of Contractor. Determine laboratory density of base course material. Perform at least one (1) field density test for every 2,000 sq. ft. of paved area, but in no case less than three (3) tests.

- B. Proof-Rolling: After the subgrade has been compacted, tested and found to meet specifications, the entire subgrade shall be mechanically proof-rolled with a heavy loaded vehicle to ensure uniformity of the subgrade. The vehicle must have a loaded FBW of 50,000 pounds with a loaded single axle weight of at least 18,000 pounds, and a tire pressure of 90 psi. subgrade which is pumping or deforming under loading must be reworked, replaced or otherwise modified, to form a smooth, stable, non-yielding base for subsequent paving courses. The Owner's Representative shall be notified at least 24 hours before final proof-rolling. All proof rolls shall be observed by the Owner's Representative.
- C. Asphaltic pavement job-mix formula shall be derived from tests performed by a qualified testing agency paid for by the Contractor. Results of previous tests performed on aggregates from same source and using asphaltic material of same brand as used in a previous mix design may be used. Submit job-mix formula to Owner's Representative prior to asphalt pavement.
- D. Contractor shall arrange and pay for non-destructive nuclear density testing by a qualified testing laboratory, acceptable to the City and independent of the Contractor. Perform field density tests as follows:
 - 1. Lower 2-inch Layer: Perform a minimum of one (1) density test per layer for each lot of 3,000 sq. yd. Of pavement or fraction thereof.
 - 2. Upper 2-inch Layer: Perform a minimum of three (3) density tests for each lot of 3,000 sq. yd. Of pavement or fraction thereof.
- E. If density is below specified amount, submit proposed corrective action to Owner's Representative.

PART 2: PRODUCTS

2.1 ASPHALTIC CONCRETE:

- A. All asphalt overlays shall be hot bituminous (PG 76-28) Grade S. The Top lift will be continuous without transverse construction joints except where abutting surfaces exist, unless otherwise approved by the Owner's Representative. Driveways and cross streets will be connected using Grade S (PG 76-28) or Grade S (PG 64-22), if desired, pending approval by the City. If the condition arises at driveway and cross streets, milling shall be required to provide a smooth blend transition to the existing asphalt. This work shall be incidental to the project. Top lift shall be 2-inch Grade S, and bottom lift shall be 2-inch Grade S, for a total of 4-inch depth.
- B. Hot-mixed asphaltic mixture conforming to CDOT Section 401, as specified by the Geotechnical Engineering Report or the Drawings.
- C. The Contractor shall submit a mix design to the City at least seven (7) days prior to the start of paving operations. Asphalt mix designs shall conform to the City Standards and Specification.

- D. The Contractor shall confirm that their asphalt supplier will be producing PG 76-28 during the time of paving. Paving is estimated to occur the Spring of 2012

2.2 ASPHALTIC CEMENT:

- A. Asphaltic cement meeting the requirements of CDOT Section 401.

2.3 AGGREGATE:

- A. Lower Layer(s) (Binder Course, if applicable): Aggregate shall conform to CDOT Section 703, Grade S, for the 19 mm (3/4 in.) nominal size.
- B. Upper Layer (Surface Course): Aggregate shall conform to CDOT Section 703, Grade SX, for the 12.5 mm (1/2 in.) nominal size.

2.4 MINERAL FILLER:

- A. Limestone dust, Portland cement, or other inert filler meeting requirements of ASTM D242 or AASHTO M17.

2.5 EQUIPMENT:

- A. Equipment shall be in accordance with CDOT Section 401 and the following criteria; alternate equipment shall be approved by Owner's Representative.
 - 1. Asphalt mixing plant designed to produce a uniform mixture within job-mix tolerances.
 - 2. Self-powered pavers capable of spreading mixture to thickness and width specified, true to line, grade and crown.
 - 3. Smooth metal-bedded haul trucks, with covers when required, to insure continuous paving operations; truck boxes shall be cleaned.
 - 4. Self-propelled steel wheeled rollers with minimum 10 ton rating.
 - 5. Self-propelled pneumatic-tired rollers capable of applying a minimum of 30 psi and a maximum of 90 psi ground contact pressure.
 - 6. A power broom or a power blower or both, as required.
 - 7. All hand tools necessary to complete the job.

2.6 AGGREGATE BASE COURSE: See Section 02232

PART 3: EXECUTION

3.1 PREPARATION:

- A. Prepare surface in accordance with CDOT Section 401.
- B. Place asphaltic mixture on a prepared, firm and compacted base or foundation course, substantially surface-dry and free and clear of loose and foreign material. Loose aggregate on roadbed shall be incorporated in shoulder construction, if any, or disposed of as directed by Owner's Representative.

- C. Prepare holes and depressions in existing asphaltic surfaces by removing loose and defective material and patching with asphalt-aggregate material, compacted to produce a tight surface conforming to adjacent area.
- D. Proof-roll prepared surface to check for unstable areas requiring additional compaction. Notify Owner's Representative of unsatisfactory conditions; do not begin paving work until such conditions have been corrected.
- E. Do not place asphaltic mixture over frozen subgrade or base or where roadbed underlying foundation or base is temporarily unstable from effects of frost heaving.
- F. Do not place asphaltic mixture when raining; remove and replace mixture adversely affected by rain or snow before final rolling.
- G. Do not place asphaltic mixture when air temperature at site of work, in shade and away from artificial heat, is less than 40 degrees F.

3.2 PREPARING MIXTURE:

- A. Prepare mixture in accordance with CDOT Section 401.
- B. Paving mixtures shall be composed of a homogeneous mixture of coarse and fine aggregate, mineral filler (when required), and asphalt cement heated to proper viscosity for uniform distribution throughout mixture.
- C. Store coarse and fine aggregates separately to prevent intermingling. Stockpile in a manner that will prevent segregation of aggregate sizes. If aggregate tends to segregate during handling, supply and stockpile aggregated in two or more sizes.
- D. When it is necessary to blend aggregates from more than one source, stockpile each aggregate individually and feed through separate bins to cold elevator feeders. Do not blend in stockpile.
- E. When aggregates proposed for work do not provide required stability or void content in compacted mixture or are deficient in fraction passing No. 200 sieve, correct deficiencies by incorporation of mineral filler into mixture or substitute other satisfactory aggregates.
- F. Dry aggregates to a moisture content of less than 1 percent. Screen dry aggregates and store in sizes that may be easily recombined into a gradation meeting requirements of job-mix formula.
- G. Feed cold aggregates uniformly to plant so that surpluses and shortages will not occur and cause breaks in continuous operation. Heat aggregate to provide a paving mixture temperature immediately after mixing of 300 degrees F +/- 15 degrees F. Mix for not less than 45 seconds; mixing times shall be based on Ross Count Procedure to achieve 95% of coated particles of surface mixture.
- H. Asphaltic mixture which is not sufficiently mixed or is defective in any manner will be rejected.

3.3 PLACING MIXTURE:

- A. Place mixture in accordance with CDOT Section 401.
- B. Construct asphaltic concrete pavement in accordance with CDOT specifications, except as otherwise designated.
- C. Place asphaltic mixture in one or more courses to the grades and typical section shown. Comply with minimum and maximum layer thickness requirements of CDOT. Final course of multi-course pavements shall be a surface course. Pavement thickness shall consist of 6-inches of full depth asphalt per the recommendations of the Geotechnical Engineer Report.
- D. Place asphaltic mixture by means of self-propelled paving machines at recommended operating speed. Place inaccessible and small areas by hand. Minimum temperature of mixture at time of placement shall be 235 degrees F.

3.4 COMPACTION:

- A. Compact pavement in accordance with CDOT Section 401.
- B. While still hot, compact course thoroughly and uniformly by rolling. Begin rolling when mixture will bear roller weight without excessive displacement. Roller speed shall be slow enough to avoid undue displacement of mixture. Compact with hot hand tampers or vibratory compactors in areas inaccessible to rollers. Do not use pneumatic tire rollers on parking lots, driveways or other areas where traffic will not smooth out roller marks.
- C. Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material. Following breakdown rolling and while mixture is hot, continue second rolling until mixture has been thoroughly compacted.

3.5 JOINTS:

- A. Place courses as nearly continuous as possible. Do not roll unprotected end of freshly laid mixture unless placement is to be discontinued long enough to permit mixture to cool.
- B. Longitudinal joints shall be made by overlapping screed onto previously laid material for a minimum of at least 1-inch depositing a sufficient amount of materials. A minimum distance of 12-inches shall be permitted between location of joints between different courses.
- C. Transverse joints shall be constructed with proper use of separation paper, and shall be at near right angles to street.

- D. Contact surfaces, manholes, valves and similar structures shall be sufficiently coated with liquid asphalt and cleaned to prevent accumulation of asphaltic material. Joints between old and new pavement and between fresh and previously cooled work shall be cut back on a straight line to provide a butt-joint for full depth of new mat. Prior to paving, clean contact surfaces and apply emulsified asphalt tack coat.

3.6 SURFACE REQUIREMENTS:

- A. Finished surface shall be smooth and true. Meet curbs, manholes, and other construction at required grades. Test surface by means of a 10 foot straightedge laid parallel to centerline of road; irregularities in excess of 1/8-inch in surface courses and 1/4-inch in binder courses from lower edge of straightedge between and two (2) contact points shall be corrected.

3.7 TRAFFIC MARKINGS: See Section 02752

3.8 PROTECTION OF WORK:

- A. Use barricades, flares, flagging and other traffic guidance to prevent damage to fresh asphalt until pavement has hardened. Maintain work during various stages of construction and until final acceptance. Any rich or bleeding areas, any breaks, raveled spots or other unsatisfactory areas in the wearing surface shall be corrected during such maintenance period.

END OF SECTION 02745

PART 1 – GENERAL**1.1 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 herein, and as required to complete the work.

1.2 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. FHWA Standard Specifications for Design and Construction, latest edition.
- C. “Manual on Uniform Traffic Control Devices” latest edition.

1.3 SUBMITTALS

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

1.4 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 FHWA Specifications.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 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. Pavement Striping: All permanent striping shall be Epoxy Pavement Markings.
- B. All permanent turn arrows, crosswalks, stop bars, railroad crossings, and lettering shall be Preformed Thermoplastic Pavement Markings, as determined by traffic requirements, white or yellow color as designated on the plans for striping and lane markings, as manufactured by 3M, as StaMark™ Pavement Marking Tape Series 270 ES, or approved substitution.
- C. Accessibility Parking: All accessibility parking shall be white and blue for the international handicapped parking symbol. Acceptable products include PreMark® by Flint, item #89230230HS, or approved substitution.

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. 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 handicapped 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.

END OF SECTION 02752

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. Concrete pavers set in aggregate setting beds.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Pavers.
- B. Samples for Verification:
 - 1. Full-size units of each type of unit paver indicated.

1.4 QUALITY ASSURANCE

- 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.
- B. Mockups: Build mockups to verify layout pattern and selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- C. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.6 PROJECT 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 unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- A. Concrete Pavers: Solid paving units, made from normal-weight concrete with a compressive strength not less than 5000 psi, water absorption not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.
 - 1. Manufacturers: Subject to compliance with requirements, as provided by General Shale Brick or approved equal.
 - 2. Thickness: 3 3/8"
 - 3. Face Size and Shape: Radial Pattern
 - 4. Color: Refer to details

2.2 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 57.
- B. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.
- C. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
 - 1. Provide sand of color needed to produce required joint color.
- D. 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 (0.250-mm) 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.

- E. 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 areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Proof-roll prepared subgrade according to requirements in Section 02300 "Earthwork" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive base course for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 - 1. For concrete pavers, a block splitter may be used.
- D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.
- E. Tolerances: Do not exceed $\frac{1}{16}$ -inch (1.6-mm) unit-to-unit offset from flush (lippage) nor $\frac{1}{8}$ inch in 24 inches (3 mm in 600 mm) from level, or indicated slope, for finished surface of paving.

3.4 AGGREGATE SETTING-BED APPLICATIONS

- A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.
- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches (300 mm).
- D. Place aggregate base, compact by tamping with plate vibrator, and screed to depth indicated.
- E. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
- F. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- G. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines.
 - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- H. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
 - 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches (900 mm) of uncompacted pavers adjacent to temporary edges.
 - 2. Before ending each day's work, compact installed concrete pavers except for 36-inch (900 mm) width of uncompacted pavers adjacent to temporary edges (laying faces).
 - 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches (90 mm) of laying face.
 - 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
- I. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- J. Do not allow traffic on installed pavers until sand has been vibrated into joints.

- K. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
 - 1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.
 - 2. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION 02780

PART 1 - GENERAL**1.01 WORK INCLUDED**

- A. Work of this Section generally includes provisions for the installation of an underground landscape irrigation system including the following:
- B. Static pressure verification and coordination of irrigation system installation with landscape material installation.
- C. Trenching, stockpiling excavation materials, refilling and compacting trenches.
- D. Complete irrigation system including but not limited to piping, backflow preventer assemblies, valves, fittings, heads, controllers and wiring, and final adjustments to insure complete coverage.
- E. Water connections.
- F. Replacement of unsatisfactory materials.
- G. Clean-up, Consultant Reviews, and Project Acceptance.
- H. Tests.

1.02 REFERENCES

- A. Perform Work in accordance with requirements of Conditions of the Contract and Division 01 - General requirements as well as provisions of all applicable laws, codes, ordinances, rules, and regulations.
- B. Conform to requirements of reference information listed below except where more stringent requirements are shown or specified in Contract Documents.
 - 1. American Society for Testing and Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section.
 - 2. Underwriters Laboratories (UL) - UL Wires and Cables.
 - 3. National Sanitation Foundation (NSF) – Piping and Backflow prevention.
 - 4. American Water Works Association - Piping and Backflow prevention.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications - Installer shall have had considerable experience and demonstrate ability in the installation of irrigation system(s) of specific type(s) in a neat, orderly, and responsible manner in accordance with recognized standards of workmanship. To

demonstrate ability and experience necessary for this Project, and financial stability, submit if requested by Consultant, prior to contract award the following:

1. List of 3 projects completed in the last 2 years of similar complexity to this Project. Description of projects shall include:

- a. Name of project.
- b. Location.
- c. Owner.
- d. Brief description of work and project budget.

B. Special Requirements:

1. Work involving substantial plumbing for installation of copper piping, backflow preventer(s), and related work shall be executed by licensed and bonded plumber(s). Secure a permit at least 48 hours prior to start of installation.
2. Tolerances - Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, compaction, and repair of finish grade treatment.
3. Coordination with Other Contractors - Protect, maintain, and coordinate Work with Work under other Section.
4. Damage To Other Improvements - Contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, or planting done under other Sections during Work associated with installation of irrigation system at no additional cost to Owner.

C. Pre-Construction Conference - Contractor shall schedule and conduct a conference to review in detail quality control and construction requirements for equipment, materials, and systems used to perform the Work. Conference shall be scheduled not less than 10 days prior to commencement of Work. All parties required to be in attendance shall be notified no later than 7 days prior to date of conference. Contractor shall notify qualified representatives of each party concerned with that portion of Work to attend conference, including but not limited to Architect, Consultant, Contractor's Superintendent, and Installer.

1. Minutes of conference shall be recorded and distributed by Contractor to all parties in attendance within five days of conference.

SUBMITTALS

- A. Prepare and make submittals in accordance with conditions of the Contract and Division 1 Specification Sections.
- B. Materials List - Submit five copies if submitting in hard-copy format or one full electronic set of a complete materials list indicating manufacturer, model number, and description of all materials and equipment to be used. Show appropriate dimensions and adequate detail to accurately portray intent of construction via cut sheets and/or shop drawings, as appropriate based on plans, details, and specification information contained within.
- C. Record Drawings (As-Builts):
 1. At onset of irrigation installation secure Autocadd files of original irrigation design from Owner. At the end of every day, revise as-built prints for work accomplished that day in red ink. As-built field prints shall be brought up-to-date at the close of the working day

every Friday by a qualified draftsman. A print of record plan(s) shall be available at Project Site. Indicate zoning changes on weekly as-built drawings. Indicate non-pressure piping changes on as-built. Upon completion of Project, but prior to scheduling of substantial acceptance walk-through, submit for review a final set of as-built mylars or electronic PDF files as required and an Autocadd disk copy. Dimensions, from two permanent points of reference (building corners, sidewalk, road intersections or permanent structures), location of following items:

- a. Connection to existing water lines.
 - b. Routing of sprinkler pressure lines (dimension maximum 100 feet along routing).
 - c. Sprinkler control valves.
 - d. Quick coupling valves.
 - e. Manual drains and stop and waste valves.
 - f. Drip line blow-out stubs.
 - g. Control wire routing if not with pressure mainline.
 - h. Gate valves.
 - i. Control wire and communication cable splices
 - j. Water meters
 - k. Locations of all sleeving including size, quantity and depth of sleeve
 - l. Flow sensors
 - m. Pressure regulating valves
2. Owner's Representative will not certify any pay request submitted by the Contractor if the as-built drawings are not current, and processing of pay request will not occur until as-builts are up-dated.
- D. Operation Instructions - Submit 3 written operating instructions including winterization procedures and start-up, with cut sheets of products, and coordinate controller/watering operation instruction with Owner maintenance personnel.
1. Controller Charts:
 - a. Do not prepare charts until Consultant has reviewed record (as-built) drawings.
 - b. Provide one controller chart for each automatic controller installed.
 - 1) Chart may be reproduction of record drawing, if scale permits fitting of controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
 - 2) Chart shall be blue-line print of actual "as-built" system, showing area covered by that controller.
 - c. Identify area of coverage of each remote control valve, using a distinctly different pastel color drawing over entire area of coverage.
 - d. Following review of charts by Consultant, they shall be hermetically sealed between two layers of 20-mm thick plastic sheet
 - e. Charts shall be completed and reviewed prior to final review of irrigation system.
- E. Provide documentation of construction and demolition waste debris recycling / salvage rates. See Section 01 74 19 - Construction Waste Management and Disposal

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with General Conditions and Division 1 Section "Product Requirements".
- B. Deliver, unload, store, and handle materials, packaging, bundling, and products in dry, weatherproof, condition in manner to prevent damage, breakage, deterioration, intrusion,

ignition, and vandalism. Deliver in original unopened packaging containers prominently displaying manufacturer's name, volume, quantity, contents, instructions, and conformance to local, state, and federal law. Remove and replace cracked, broken, or contaminated items or elements prematurely exposed to moisture, inclement weather, snow, ice, temperature extremes, fire, or jobsite damage.

- C. Handling of PVC Pipe - Exercise care in handling, loading and storing, of PVC pipe. All PVC pipe shall be transported in a vehicle that allows length of pipe to lie flat so as not to subject it to undue bending or concentrated external loads. All sections of pipe that have been dented or damaged shall be discarded, and if installed, shall be replaced with new piping.

1.05 JOBSITE CONDITIONS

A. Protection of Property:

1. Preserve and protect all trees, plants, monuments, structures, and paved areas from damage due to Work of this Section. In the event damage does occur, all damage to inanimate items shall be completely repaired or replaced to satisfaction of Owner, and all injury to living plants shall be repaired by Owner. All costs of such repairs shall be charged to and paid by Contractor.
2. Protect buildings, walks, walls, and other property from damage. Flare and barricade open ditches. Damage caused to asphalt, concrete, or other building material surfaces shall be repaired or replaced at no cost to Owner. Restore disturbed areas to original condition.

B. Existing Trees:

1. All trenching or other Work under limb spread of any and all evergreens or low branching deciduous material shall be done by hand or by other methods so as to prevent damage to limbs or branches.
2. Where it is necessary to excavate adjacent to existing trees use all possible care to avoid injury to trees and tree roots. Excavation, in areas where 2 inch and larger roots occur, shall be done by hand. Roots 2 inches or larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a trenching machine is operated close to trees having roots smaller than 2 inches in diameter, wall of trench adjacent to tree shall be hand trimmed, making clean cuts through roots. Trenches adjacent to trees shall be closed within 24 hours, and when this is not possible, side of trench adjacent to tree shall be kept shaded with moistened burlap or canvas.

C. Protection and Repair of Underground Lines:

1. Request proper utility company to stake exact location (including depth) of all underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these underground lines from damage. If damage does occur, Utility Owner shall repair all damage. Contractor shall pay all costs of such repairs unless other arrangements have been made.
2. Request Owner, in writing, to locate all private utilities (i.e., electrical service to outside lighting) before proceeding with excavation. If, after such request and necessary staking, private utilities that were not staked are encountered and damaged by Installer, Owner shall repair them at no cost to Installer. If Contractor damages staked or located utilities,

they shall be repaired by Utility Owner at Contractor's expense unless other arrangements have been made.

- D. Replacement of Paving and Curbs - Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition.

1.06 WARRANTY/GUARANTY

- A. Manufacturer shall warrant materials against defects for a period of one year from date of Substantial Completion. Installer(s) shall guaranty workmanship for similar period.
- B. Settling of backfilled trenches that may occur during guaranty period shall be repaired at no expense to Owner, including complete restoration of damaged property.
- C. Expenses due to vandalism before substantial completion shall be borne by Contractor.
- D. Owner will maintain turf and planting areas during warranty period, so as not to hamper proper operation of irrigation system.

1.07 MAINTENANCE

- A. Furnish the following maintenance items to Owner prior to final Acceptance:
 - 1. Two Sets of special tools required for removing, disassembling, and adjusting each type of sprinkler head and valve supplied on this Project.
 - 2. One eight foot valve key for operation of stop and waste valve.
 - 3. Two six foot valve keys for operation of gate valves.
 - 4. Two keys for each automatic controller.
 - 5. Two quick coupler keys and two matching hose swivels for each type of quick coupling valve installed.
 - 6. Two aluminum drain valve keys of sufficient length for operation of drain valves.
 - 7. Remote
- B. Winterization - include cost in bid for winterizing complete system at conclusion of sprinkling season (in which system received final acceptance) within 3 days notification by the Owner. System shall be voided of water using compressed air or similar method reviewed by Consultant. Reopen, operate, and adjust system malfunctions accordingly during April of following season within 3 days of notification by Owner.

1.08 EXTRA STOCK - In addition to installed system furnish the following items to Owner:

- A. 10 Pop-up spray heads with nozzles of each type used.
- B. 4 Rotor heads of each type used.

- C. 30 Drip emitters of each type used.
- D. 2 2-wire decoder –single station units

PART 2 - PRODUCTS

2.1 MATERIALS

A. General Piping:

1. Pressure Supply Line (from tap on city mains to winterization tee or Stop and Drain valve prior to backflow prevention unit) – Type “K” Soft Copper (3/4” – 2 1/2”), and ductile iron (3” and larger).
2. Pressure Supply Line (from point of connection, winterization tee or Stop and Drain valve and through backflow prevention unit) - Type "K" Hard Copper (3/4” – 2 1/2”), and ductile iron (3” and larger).
3. Pressure Supply Lines (downstream of backflow prevention units) – Type "K" Hard Copper (3/4” – 2 1/2”), Class 200 PVC BE (1" - 2 1/2") and Class 200 PVC RT (3" and larger), as noted on plans and schedule.
4. Non-pressure Lines - Class 200 PVC BE, 1” minimum size, as noted on plans.
5. Sleeving - Class 160 PVC, as noted on plans and schedule.
6. Drip Tubing - Toro Dura-Pol EHD 1645 3/4" with .050 inch wall thickness.
7. Emitter Tubing - As recommended by emitter manufacturer.

B. Copper Pipe and Fittings:

1. Copper Pipe - Type K, hard tempered or annealed coil.
2. Fittings - Wrought copper, solder joint type.
3. Joints - Soldered with solder, 45% silver, 15% copper, 16% zinc, and 24% cadmium and solidus at 1125~F and liquids at 1145~F.

C. Brass Pipe and Fittings:

1. Brass Pipe - 85% red brass, ANSI Schedule 40 screwed pipe.
2. Fittings - Medium brass, screwed 125-pound class.

D. Ductile Iron Pipe and Fittings:

1. Ductile Iron Pipe – Centrifugal cast ductile iron in metal molds for water pipe in accordance with ANSI C151 and AWWA A21.51 with asphaltic exterior coating and interior lining and coating in accordance with ANSI C151 and AWWA A21.

2. Fittings – Mechanical joint as supplied by the pipe manufacturer and rated for working pressures of 350 psi.
3. Gaskets – Furnish in accordance with ANSI C111 and AWWA A21.11.

E. Plastic Pipe and Fittings:

1. Identification Markings:
 - a. Identify all pipe with following indelible markings:
 - 1) Manufacturer's name.
 - 2) Nominal pipe size.
 - 3) Schedule of class.
 - 4) Pressure rating.
 - 5) NSF (National Sanitation Foundation) seal of approval.
 - 6) Date of extrusion.
2. Solvent Weld Pipe - Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12454-B, Type 1, Grade 1.
 - a. Fittings - Standard Weight, Schedule 40, and injection molded PVC; complying with ASTM D1784 and D2466, cell classification 12454-B.
 - 1) Threads - Injection molded type (where required).
 - 2) Tees and ells - Side gated.
 - b. Threaded Nipples - ASTM D2464, Schedule 80 with molded threads.
 - c. Teflon Tape – All PVC male threaded fittings and nipples, excluding marlex fittings, shall receive wrapping of Teflon tape applied to threaded surfaces per pipe manufacturer's recommendations.
 - d. Joint Cement and Primer - Type as recommended by manufacturer of pipe and fittings.
3. Gasketed End Pipe - Manufactured from virgin Polyvinyl Chloride compound in accordance with ASTM D2241 and ASTM D1784; cell classification 1254-B, Type 1, Grade 1.
 - a. Fittings and Services Tees - Ductile iron, grade 70-55-05 in accordance with ASTM A-536. Fittings shall have deep bell push-on joints with gaskets meeting ASTM F-477.
 - b. Joint Restraint System – As recommended manufacturer of pipe fittings.
 - c. Gaskets - Factory installed in pipe and fittings, having a metal or plastic support within gasket or a plastic retainer ring for gasket.
 - d. Lubricant - As recommended by manufacturer of pipe fittings.
4. Flexible Plastic Pipe - Manufactured from virgin polyethylene in accordance with ASTM D2239, with a hydrostatic design stress of 630 psi and designated as PE 2306.
 - a. Fittings – Insert type manufactured in accordance with ASTM D2609; PVC Type 1 cell classification 12454-B.
 - b. Clamps - All stainless steel worm gear screw clamps. Use 2 clamps per joint on 1-1/2 inch and 2 inch fittings.

F. Drip Irrigation Systems:

1. Drip Tubing - Manufactured of flexible vinyl chloride compound conforming to ASTM D1248, Type 1, Class C, Category 4, P14 and ASTM D3350 for PE 122111C.
 2. Fittings - Type and diameter recommended by tubing manufacturer.
 3. Drip Valve Assembly - Type and size shown on Drawings.
 - a. Wye Strainer - Plastic construction with 150 mesh nylon screen and 1/2 inch blowout assembly.
 - b. Control Valve - 2 way, solenoid pilot operated type made of synthetic, non-corrosive material; diaphragm activated and slow closing. Include freely pivoted seat seal; retained (mounted) without attachment to diaphragm.
 - c. Pressure Reducing Valve - Plastic construction as detailed.
 - d. Single station 2-wire decoder.
 4. Emitters - Single port, pressure compensating, press on type.
- G. Gate Valves:
1. Gate Valves for 3/4 inch through 2-1/2 Inch Pipe - Brass construction; solid wedge, IPS threads, and non-rising stem with cross operating handle.
 2. Gate Valves for 3 Inch and Larger Pipe - Iron body, brass or bronze mounted AWWA gate valves with a clear waterway equal to full nominal diameter of valve; rubber gasket or mechanical joint-type only. Valves shall be able to withstand a continuous working pressure of 200 psi and be equipped with a square operating nut and resilient wedge. Provide pipe restraints on gate valves 3 inches or larger as detailed.
- H. Quick Coupling Valves - Brass two-piece body designed for working pressure of 125 PSI; operable with quick coupler. Equip quick coupler with locking rubber cover.
- I. Valve Boxes:
1. Gate Valves, Quick Coupling Valves, Drain Valves, Drip Line Blow-out Stubs, and Wire Splice or Stub Box - Carson Brooks #910-10, box w/ Bolt Down Cover as detailed.
 2. 1 inch through 2 inch Control Valves, Master Valves, Pressure Regulating Valves and Communication Cable Splice box, Sub-meters - Carson Brooks #1419-12 box, w/ Bolt Down Cover as detailed.
 3. Drip Valve Assemblies and Flow Sensors - Carson Brooks #1220-12 box w/ Bolt Down Cover, Carson Brooks #1730-12 box, as detailed.
- J. Electrical Control Wiring:
1. Low Voltage – (2-Wire Decoder Cable):
 - a. Electrical Control Wire - UFUL approved, EV-CAB-COM or as per manufactures requirements, direct burial copper wire to operate system as designed.
 - b. If multiple controllers are utilized, each controller shall have its own 2-wire decoder cable run, controllers cannot be connected with same 2-wire run.
 - c. Loop five (5) feet minimum of 2-wire cable into all valve boxes.
 - d. Control Wire connections and splices shall be made with 3M DBY or King 600 DBY/R direct bury splice, or as required by the controller manufacturer.

- 2. High Voltage - Type required by local codes and ordinances, of proper size to accommodate needs of equipment serviced.
- K. Automatic Controller - Size and type shown on Drawings; mounted as detailed.
 - 1. Automatic Controller (2-Wire) - Size and type shown on Drawings; mounted as detailed.
 - a. Single Station Decoders (2-Wire) - Size and type shown on Drawings; mounted as detailed.
 - b. Install decoders and wire per manufacture recommendations and requirements.
 - c. Grounding for all decoders and 2-wire decoder cable, to be per manufactures recommendations and requirements. Minimum one grounding assembly per every 500' of wire or every 8TH decoder and at all ends of 2-wire decoder cable run.
- L. Electric Control Valves - Size and type shown on Drawings having manual flow adjustment and manual bleed nut.
 - 1. Single station 2-wire decoder.
- M. Sprinkler Heads - As indicated on Drawings. Fabricated riser units in accordance with details on Drawings - with fittings and nipples of equal diameter as riser inlet in sprinkler body.

PART 3 - EXECUTION

3.1 SITE CONDITIONS, LANDSCAPE PLAN REVIEW AND COORDINATION

- A. Contractor will be held responsible for coordination between landscape and irrigation system installation. Landscape material locations shown on the Landscape Plan shall take precedence over the irrigation system equipment locations. If irrigation equipment is installed in conflict with the landscape material locations shown on the Landscape Plan, the Contractor will be required to relocate the irrigation equipment, as necessary, at Contractor's expense.
- B. Contractor is responsible to notify Consultant of any field conditions that vary from the conditions shown on the Irrigation Construction Documents. If Contractor fails to notify Consultant of these conditions, Contractor will be held responsible for all costs associated with system adjustments required due to the change in field conditions.
- C. Comply with the requirements of Section 31 25 00, TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN for preparation and protection of the site.

3.2 STATIC PRESSURE VERIFICATION

- A. Contractor shall field verify the static pressure at the project site, prior to commencing work or ordering irrigation materials, and submit findings, in writing, to Consultant. If Contractor fails to verify static water pressure prior to commencing work or ordering irrigation materials, Contractor shall assume responsibility for all costs required to make system operational and the

costs required to replace any damaged landscape material. Damage shall include all required material costs, design costs and plant replacement costs.

3.3 INSPECTION

- A. Examine areas and conditions under which Work of this Section is to be performed. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Grading operations, with the exception of final grading, shall be completed and approved by Owner before staking or installation of any irrigation system begins.
- C. Underground Utilities shall be installed prior to installation of irrigation system. If irrigation installation takes place prior to utility installation, Contractor shall notify Owner of this condition in writing prior to commencement of irrigation installation.

3.4 PREPARATION:

- A. Staking shall Occur as Follows:
 - 1. Mark, with powdered lime, routing of pressure supply line and flag heads for first few zones. Contact Consultant 48 hours in advance and request review of staking. Proposed locations of all trees shall be field staked by Contractor and approved by Owner/Landscape Architect prior to Consultant review of irrigation staking. Consultant will advise installer as to the amount of staking to be prepared. Consultant will review staking and direct changes if required. Review does not relieve installer from coverage problems due to improper placement of heads after staking.
 - 2. Contractor shall contact Consultant if field spacing varies by +/- 10% of the spacing shown on the irrigation plans. If Contractor fails to notify Consultant of variances exceeding 10%, Contractor assumes full responsibility for the costs associated with any required system modifications deemed necessary by the Consultant or Owner.
 - 3. If Project has significant topography, freeform planting beds, or other amenities, which could require alteration of irrigation equipment layout as deemed necessary by Consultant, do not install irrigation equipment in these areas until Consultant has reviewed equipment staking.
- B. Install sleeving under asphalt paving and concrete walks, prior to concreting and paving operations, to accommodate piping and wiring. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content in accordance with STM D1557.
- C. Trenching - Trench excavation shall follow, as much as possible, layout shown on Drawing. Dig trenches straight and support pipe continuously on bottom of trench. Trench bottom shall be clean and smooth with all rock and organic debris removed.
 - 1. Clearances:
 - a. Piping 3 Inches and Larger - Make trenches of sufficient width (14 inches minimum) to properly assemble and position pipe in trench. Minimum clearance of piping 3 inches or larger shall be 5 inches horizontally on both sides of the trench.
 - b. Piping Smaller than 3 Inches - Trenches shall have a minimum width of 7 inches.
 - c. Line Clearance - Provide not less than 6 inches of clearance between each line and not less than 12 inches of clearance between lines of other trades.

2. Pipe and Wire Depth:
 - a. Pressure Supply Piping – 24 inches from top of pipe minimum or as noted on plans.
 - b. PVC Sleeving – To match depth of sleeved material.
 - c. Non-pressure Piping (rotor) - 18 inches from top of pipe.
 - d. Non-pressure Piping (pop-up) - 14 inches from top of pipe.
 - e. Control Wiring/Communication Cable - Side of pressure main or at 18 inch depth if installed in a separate trench with no mainline piping.
 - f. Drip Tubing - 12 inches from top of pipe.
 - g. Emitter Tubing (Micro-tubing) - 8 inches from top of pipe.
3. Boring will be permitted only where pipe must pass under obstruction(s) which cannot be removed. In backfilling bore, final density of backfill shall match that of surrounding soil. It is acceptable to use sleeves of suitable diameter installed first by jacking or boring, and pipe laid through sleeves. Observe same precautions as though pipe were installed in open trench.
4. Vibratory Plow - Non-pressure piping may be installed through use of vibratory plow method if consultant determines soil conditions are satisfactory for this method of installation. Vibratory plowing does not relieve installer of minimum pipe depths.

3.5 INSTALLATION - Locate other equipment as near as possible to locations designated. Consultant shall review deviations prior to installation.

- A. PVC Piping - Snake pipe in trench as much as possible to allow for expansion and contraction. Do not install pipe when air temperature is below 40 degrees F. Place manual drain valves at low points and dead ends of pressure supply piping to insure complete drainage of system. When pipe installation is not in progress, or at end of each day, close pipe ends with tight plug or cap. Perform Work in accordance with good practices prevailing in piping trades.
 1. Solvent Weld PVC Pipe - Lay pipe and make all plastic to plastic joints in accordance with manufacturer's recommendations.
 2. Gasketed End Pipes with Joint Restraint System:
 - a. Lay pipe and make pipe-to-fitting or pipe-to-pipe joint, following the manufacturer's recommendations. Install joint restraint fittings and pipe restraints on all fittings and adjacent pipe runs per manufacturer's recommendations and as shown on plans.
 - b. Prior to backfilling any joint restraints, the Project Manager shall be present to verify that the restraints were installed in the proper locations and that all bolts have been tightened to the manufacturer's recommendations. Any restraints that are buried prior to inspections shall be excavated to allow for review and inspection prior to approval.
- B. Drip Tubing:
 1. Make all fitting connections as per manufacturer's recommendations.
 2. Use only manufacturer provided or recommended hole punch when making penetrations in drip tubing for insert fittings. Use of any other hole punch shall be cause for immediate removal and replacement of all installed drip tubing.
 3. Install drip line blow-out stubs at all dead ends of drip tubing.

C. Control Wiring:

1. Low Voltage Wiring– 2-Wire:

- a. Bury control wiring between controller and electric valves in pressure supply line trenches, strung as close as possible to main pipe lines with such wires to be consistently located below and to one side of pipe, or in separate trenches.
- b. Provide an expansion loop at every pressure pipe angle fitting, every electric control valve location (in valve box), and every 500 feet. Minimum 5 feet in every valve box, 2 feet at every angle fitting and 10 feet at every future phase line.
- c. Make all splices and E.C.V. connections using 3M DBY-6, King 600 DBR/Y connectors, or similar dry splice method.
- d. Install all control wire splices not occurring at control valve in a separate splice valve box.
- e. Install one decoder for each control valve or as indicated on plans.
- f. The wire paths shall be sized per distance requirements or as shown on plan. The two wire decoder cable shall be of the type indicated on the plans or per manufacturer recommendation.
- g. The two-wire paths may be spliced, or “teed”, permitting extensions of the path in multiple directions. In general, the distance from the controller to the end of any one end of a “tee” or wire run shall not exceed the maximum for the gauge of wire, even if the total of all wire exceeds that number. All wire splices must be made in a valve box with DBR-6 or equal direct-burial waterproof connectors.
- h. Grounding of decoders and decoder wire shall occur every 500' of wire or every 8TH decoder and at all ends of 2-wire decoder cable run.
- i. Grounding shall occur at right angles to wire path and shall have an impedance of 10 Ohms or less, or shall meet the standards of the Earth Grounding Guidelines by ASIC.
- j. Where limits of work consist of narrow areas that make grounding rods installed at right angles a hardship, contractor shall utilize grounding plates installed at a minimum distance of 4' offset and parallel to wire path. Avoid installing grounding near other electrical equipment.

D. Automatic Controller:

1. Install controller in accordance with manufacturer's instructions as detailed and where shown on Drawings.
2. Connect remote control valves to controller in numerical sequence as shown on Drawings.
3. Owner shall approve final location of controller prior to installation.
4. Each controller shall have a dedicated separate ground wire and grounding rod as detailed. Earth grounding shall be connected via a factory supplied copper ground lug inside the controller, for connection to earth ground hardware via 6 AWG(4mm dia.) copper wire (see ASIC Earth Grounding Guideline 100-2002 for details of earth grounding irrigation control systems available online at www.asic.org). Ground wire shall be extended underground, at right angles to any communications wiring, to approved direct burial earth grounding hardware at least 6 ft./2m from the controller location. Earth Ground shall be have an impedance of 10 Ohms or less, or shall meet the standards of the Earth Grounding Guideline cited above.
5. Connect remote control valves to controller in numerical sequence as shown on Drawings.

6. All above ground conduit shall be rigid galvanized with appropriate fittings. All below ground conduit shall be schedule 40 PVC.
- E. Electric Control Valves - Install cross-handle four inches below finished grade where shown on Drawings as detailed. When grouped together, allow minimum of 12 inches between valve box sides. Install each remote control valve in a separate valve box. Install valve box flush with grade or when present flush with surfacing material (rock mulch). When parallel to roadway, sidewalk or other permanent element or structure, control valve and box to be installed perpendicular to element or structure, spaced equally.
1. All connections in the two-wire paths (outside the controller enclosure) shall be made with 3M DBR-6 waterproof, strain-relieving direct burial connectors, or exact equals. Decoder output to solenoid connections shall be made with 3M DBY waterproof, strain-relieving connectors, or exact equals. No substitution of wire or wire connector specifications is permissible. All connections, tees, and splices shall be positioned in valve boxes for future location and service.
 2. The installer shall provide adequate earth ground (not to exceed 10 Ohms, or in compliance with practices as defined in American Society of Irrigation Consultants Earth Grounding Guideline 100-2002, available at www.asic.org) and connect it to one of the decoder ground leads 500' of wire or every 8TH decoder, whichever is shorter. Minimum ground hardware shall be a 4" x 36" (100 x 915mm) copper plate with at least 10AWG/2.5mm dia. copper wire.
 3. Ground connections from decoder ground lead to grounding hardware shall be made by joining the 12AWG (2mm dia.) decoder ground wire with a 10AWG (2.5mm dia.) solid copper lead in an approved wire nut of appropriate size, inserted in a DBR-6 waterproof direct burial connector, or with an approved wire clamp. Ground hardware shall extend at right angles from the two-wire path, and ground hardware shall be located at least 8ft./2m away from the two-wire path.
 4. Where limits of work consist of narrow areas that make grounding rods installed at right angles a hardship, contractor shall utilize grounding plates installed at a minimum distance of 4' offset and parallel to wire path. Avoid installing grounding near other electrical equipment.
- F. Quick Coupling Valves - Install quick couplers on swing-joint assemblies as indicated on construction details; plumb and flush to grade. Angled nipple relative to pressure supply line shall be no more than 45 degrees and no less than 10 degrees.
- G. Drip and Sub-Surface Valve Assemblies - Install valve assembly as detailed.
- H. Drip Emitters - Stake all surface emitters as detailed and staked with acceptable tubing stakes.
- I. Drain Valves - Install one manual drain valve on pressure supply line directly downstream of backflow preventer and at all low points in pressure supply line as detailed. Provide a three cubic foot drainage sump for drain valve as detailed.
- J. Valve Boxes:
1. Install one valve box for each type of valve installed as detailed. Valve box extensions are not acceptable except for master valves and flow sensors. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted.

2. Brand controller letter and station number on lid of each valve box. Letter and number size shall be no smaller than 1 inch and no greater in size than 1 1/2 inches. Depth of branding shall be no more than 1/8 inch into valve box lid.
 3. Concrete polymer boxes shall be labeled with branded inserts per manufacturer's recommendations.
- K. Gate Valves - Install where shown on Drawings as detailed.
- L. Sprinkler Heads - Install sprinkler heads where designated on Drawings or where staked. Set to finish as detailed. Spacing of heads shall not exceed the maximum indicated on Drawing unless re-staked as directed by Consultant. In no case shall the spacing exceed maximum recommended by manufacturer. Install heads on swing joints or riser assemblies as detailed. Adjust part circle heads for proper coverage. Adjust heads to correct height after sod is installed. Plant placement shall not interfere with intended sprinkler head coverage, piping, or other equipment. Consultant may request nozzle changes or adjustments without additional cost to the Owner.
- M. Backfilling - Do not begin backfilling operations until required system tests have been completed. Backfill shall not be done in freezing weather except with review by Consultant. Leave trenches slightly mounded to allow for settlement after backfilling is completed. Trenches shall be finish graded prior to walk-through of system by Consultant.
1. Materials - Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of rubbish, vegetable matter, frozen materials, and stones larger than 1 inch in maximum dimension. Do not mix subsoil with topsoil. Material not suitable for backfill shall be hauled away. Contractor shall be responsible for providing suitable backfill if excavated material is unacceptable or not sufficient to meet backfill, compaction, and final grade requirements.
 2. Do not leave trenches open for a period of more than 48 hours. Open excavations shall be protected in accordance with OSHA regulations.
 3. Compact backfill to 90% maximum density, determined in accordance with ASTM D155-7 utilizing the following methods:
 - a. Mechanical tamping.
 - b. Puddling or ponding. Puddling or ponding and/or jetting is prohibited within 20'-0" of building or foundation walls.
- N. Piping Under Paving:
1. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete or concrete paving.
 2. Piping located under areas where asphalt or concrete paving will be installed shall be bedded with sand (a layer 6" below pipe and 6" above pipe).
 3. Compact backfill material in 6" lifts at 90% maximum density determined in accordance with ASTM D1557 using manual or mechanical tamping devices.
 4. Set in place, cap, and pressure test all piping under paving, in presence of Owner prior to backfilling and paving operations.

5. Piping under existing walks or concrete pavement shall be done by jacking, boring, or hydraulic driving, but where cutting or breaking of walks and/or concrete is necessary, it shall be done and replaced at no cost to Owner. Obtain permission to cut or break walks and/or concrete from Owner.
- O. Water Supply and Point of Connection - Water supply shall be extended as shown from water supply lines.

3.6 FIELD QUALITY CONTROL:

- A. Flushing - After piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads, quick coupler assemblies, and hose valves, thoroughly flush piping system under full head of water pressure from dead end fittings. Maintain flushing for 5 minutes through furthest valves. Cap risers after flushing.
- B. Pressure Testing - Conduct test in presence of Consultant. Arrange for presence of Consultant 48 hours in advance of testing. Supply force pump and all other test equipment. Compressed air shall not be used for pressure testing system.
 1. After backfilling, and installation of all control valves, fill pressure supply line with water, and pressurize to 40 PSI over the designated static pressure or 120 PSI, whichever is greater, for a period of 2 hours.
 2. Leakage, Pressure Loss - Test is acceptable if no loss of pressure is evident during the test period.
 3. Leaks - Detect and repair leaks.
 4. Retest system until test pressure can be maintained for duration of test.
 5. Before final acceptance, pressure supply line shall remain under pressure for a period of 48 hours.
 6. Pressure test shall be scheduled and passed prior to scheduling of Substantial Completion Walk-through.
- C. Walk-Through for Substantial Completion:
 1. Arrange for Consultant's presence 48 hours in advance of walk-through.
 2. Entire system shall be completely installed and operational prior to scheduling of walk-through.
 3. Operate each zone in its entirety for Consultant at time of walk-through and additionally, open all valve boxes if directed.
 4. Generate a list of items to be corrected prior to Final Completion.
 5. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.
 6. During walk-through, expose all drip emitters under operations for observation by Consultant to demonstrate that they are performing and installed as designed, prior to placing of all mulch material. Schedule separate walk-through if necessary.
 7. Supply Consultant with prints of irrigation as-builts prior to scheduling substantial completion walk-through.

D. Walk-Through for Final Completion:

1. Arrange for Consultant's presence 48 hours in advance of walk-through.
2. Show evidence to Consultant that Owner has received all accessories, charts, record drawings, and equipment as required before Final Completion walk-through is scheduled.
3. Operate each zone, in its entirety for Consultant at time of walk-through to insure correction of all incomplete items.
4. Items deemed not acceptable by Consultant shall be reworked to complete satisfaction of Consultant.
5. If after request to Consultant for walk-through for Final Completion of irrigation system, Consultant finds items during walk-through which have not been properly adjusted, reworked, or replaced as indicated on list of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in amount equal to additional time and expenses required by Consultant to conduct and document further walk-throughs as deemed necessary to insure compliance with Contract Documents.

3.7 ADJUSTING - Upon completion of installation, fine-tune entire system by adjusting patterns and break-up pins, and setting pressure reducing valves at proper and similar pressure to provide optimum and efficient coverage. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. Heads of same type shall be operating at same pressure +/- 10%.

- A. If it is determined that irrigation adjustments will provide proper coverage, and improved water distribution as determined by Consultant, contractor shall make such adjustments prior to Final Acceptance, as directed, at no additional cost to Owner. Adjustments may also include changes in nozzle sizes, degrees of arc, and control valve throttling.
- B. All sprinkler heads shall be set perpendicular to finish grade unless otherwise noted on Construction Plans or directed by Consultant.
- C. Areas which do not conform to designated operation requirements due to unauthorized changes or poor installation practices shall be immediately corrected at no additional cost to the Owner.

3.8 CLEANING - Maintain continuous cleaning operation throughout duration of work. Dispose of, off-site at no additional cost to Owner, all trash or debris generated by installation of irrigation system.

- A. Comply with the requirements of Section 31 25 00, TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN for preparation and protection of the site.

END OF SECTION 02810

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, and Division – 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of installing boulder walls.
- 1.3 RELATED WORK:
 - A. Earthwork – Section 02200.
- 1.4 SUBMITTALS:
 - A. As specified in Section 01300.

PART 2 - PRODUCTS

- 2.1 LANDSCAPE BOULDERS :
 - A. Stone Source:
 1. The Contractor shall supply and install landscape boulders as shown on the plans. The Landscape Architect will direct final placement of these boulders in all locations. The boulders shall be high quality Loveland Buff Sandstone as provided by Arkins Park Stone Co. in Loveland (970)663-1920 or approved equal.
 - B. Sizes:
 1. Refer to plans for exact dimensions.

PART 3 – EXECUTION

- 3.1 INSTALLATION: The Owner Representative shall be present for the placement of all landscape boulders. Place as shown on plans. Prior to backfilling, receive approval of all boulder locations. Backfill with excavated material. Thoroughly compacted backfill and blend smoothly with surrounding terrain.
 - A. All boulders shall be buried to 1/3 the total rock depth.
 - B. Exposes scrapes and machine scratch marks caused by excavating, transporting and placing of rocks shall be removed by heat treating affected areas with an acetylene torch, or approved means.

END OF SECTION 02830

PART – GENERAL

- 1.1 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, Division - 1 Specification sections, apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of furnishing and installing signs and signposts.
- 1.3 SUBMITTALS: As specified in Section 01300.
 - A. Samples or Manufacturer's Literature: Sign facing materials.
- 1.4 STORAGE AND HANDLING: Protect signs from damage during transportation. Store all materials off ground under protective covering.
- 1.5 RELATED WORK:
 - A. Asphalt Pavement – Section 02745
 - B. Cast-in-Place Concrete - Section 03300

PART 2 – PRODUCTS

- 2.1 POSTS: Galvanized steel, 2-inch square, Telespar Sign Support System, manufactured by Unistrut Corp., Wayne, Michigan, or approved equal.
- 2.2 SIGNS: As manufactured by Colorado Stonehouse Signs, Inc., 5550 W. 60th Avenue, P.O. Box 546, Arvada, CO 80001, (303) 422-2356.
 - A. Sign Material: As shown on plans.
 1. "Handicap Parking Only" Model # DE-3554A.
 - B. Hardware: Galvanized steel, ASTM A307-90.
- 2.3 CONCRETE FOOTING: Section 03300

PART 3 – EXECUTION

- 3.1 POSTS: Galvanized steel. Provide 8-inch diameter by 2' depth concrete footing.
- 3.2 SIGNS: Install in location as shown on drawings. Set post and sign plumb. Bottom of sign to set 4 feet above finished grade. Post to extend a minimum of 2 feet below grade.

- 3.3 PAINT: Paint with two (2) coats of enamel. Paint exposed hardware metal to match adjacent areas.

END OF SECTION 02849

PART 1 GENERAL**1.1 Description of Work**

A. The Contractor shall supply all labor, materials and equipment necessary to furnish and install a synthetic, resilient material of gradated rubber granules and polyurethane binding agents mixed and poured-in-place on site, as required by the drawings and specifications.

B. Qualifications/References: The contractor must be certified by the manufacturer. The Contractor or subcontractor must have proven successful experience in the construction installation of poured in place resilient matting within the last three (3) years. The Contractor or their subcontractor designated to perform this work, shall be required to submit three (3) references, 2 of which are in similar climates, for projects, which demonstrate successful experience with similar work. These projects must have been installed for a minimum of one (1) year. The installation must be completed by certified factory installers from the location of the manufacturer.

C. Warranty and Guarantee: The manufacturer shall guarantee all materials to be free from defects in workmanship and materials for a period of five (5) years. Defects include edge raveling, resistance to mildew, bacterial growth, bubbling, delaminating, peeling, loss of integrity, color fading, shedding, cracking, shrinkage and poor UV stability, temporary yellowing or discoloration. The manufacturer must warrant the product to perform in accordance with specifications and against material breakdowns caused by failure of chemical bond under normal use.

PART 2 PRODUCTS**2.1 Resilient Matting Material**

Surface America Poured In Place or approved equal. Refer to plans for colors.

New resilient matting material shall be a seamless, poured-in-place, hand-troweled application. The surfacing system shall consist of a rubber SBR cushion layer and a top EPDM rubber granule wearing course. All rubber granules shall be bound together with a polyurethane binder. The entire system is poured over a compacted aggregate base course. The thickness of the layers shall be from manufacturers recommendations based on possible fall height.

A. Materials

1. Polyurethane Primer and Binder: Elastic polyurethane, Methylene Diphenyl Isocyanate (MDI) based binder with no Toluene Diphenyl Isocyanate (TDI) added. Binder shall contain no solvents, have a low odor, and shall be ultra violet resistant.

2. Wearing Course: Ethylene-Propylene-Dien-Monomere (EPDM) pigmented synthetic rubber granules chipped and gradated to 1-3.5 mm in size. Strand or shredded rubber is not acceptable. Binder for the wearing course only shall be non-ambering and aliphatic.

3. Cushion Course: Styrene-Butadien-Rubber (SBR) processed rubber granules, cellular rubber granules and polyurethane binder. The entire surface system shall be permeable to water at approximately 0.5 gal/sec.

PART 3 EXECUTION

3.1 Resilient Matting Material

A. Cushion Course: Contractor shall install thick cushion course (thickness as required by manufacturer) over the compacted aggregate base. The total thickness shall be recommended per ASTM 1292-99.

The Contractor shall adhere to the following installation procedure:

1. Determine manageable batch size.
2. Thoroughly mix ingredients by mechanical drum mixer to ensure all granules are coated. Rubber granules, binder and mixing additives must be mixed at least 2 minutes to ensure a complete coating of particles.
3. Establish reference points using screed strips to establish proper depth of Poured-in-Place cushion course. The cushion course shall be Poured-in-Place by means of screeding and hand troweled to maintain a seamless application.
4. Prior to placement of the cushion course, the Contractor shall prime the vertical edges of all existing concrete to ensure matting does not pull away from edges.
5. Allow the cushion course to cure completely before installing the top wearing course surface.

B. Top Wearing Course:

The poured cap material shall be composed of EPDM granular rubber and polyurethane resin. The thickness of the poured cap material shall be determined by manufacturer but shall not be less than ½" thick. The wearing course shall be screed, troweled, and compacted onto the cushion course. To maintain a seamless application, the top-wearing course must be completed within one working day. All rubber shall remain consistent in gradation and size. Color tinted binder will not be allowed.

The wearing course must be compacted manually by using hand trowels and light rollers. All mixing shall be done by means of the mixmatic M 1200 D. Rubber granules, polyurethane binder and mixing additives must be mixed at least 2 minutes to ensure a complete coating of the particles.

C. Curing Time: Curing time in between the cushion course and top wearing course shall be approximately 12 hours. Curing time before use must be at least 48 hours after completion of wearing surface.

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, and Division -1 Specification section, apply to Work of this section.
- 1.02 DESCRIPTION: The work of this section consists of installing the specified playground equipment.
- 1.03 SUBMITTALS: As specified in Section 01300.
- A. Submit product data for all manufactured items.
- 1.04 RELATED WORK:
- A. Concrete Walks, Curbs and Misc. Flatwork- Section 02520
- 1.05 PLAYGROUND INSTALLER EXPERIENCE
- A. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.
- B. Play Equipment Installation
1. Installer shall have a minimum of five (5) years of experience in the installation of similar play structures. Contractor shall provide project references and addresses for playgrounds of similar size.
 2. Installation shall be in accordance with the manufacturer's shop drawings and directions.

PART 2 - PRODUCTS

- 2.01 Refer to Drawings for Playground Equipment manufacturer, model and color
- 2.02 Playground Surface: Refer to section 02865.
- A. Surfacing shall be IPEMA-certified Engineered Wood Fiber by Fibar Group LLC, Armonk, NY 800-342-2721 or approved equal. Standard wood chips, bark mulch, or material manufactured from recycled pallets will not be acceptable.
- A. Underdrain system shall be Fiber Drain by Fibar Group LLC, Armonk, NY 800-342-2721 or approved equal.

PART 3 - EXECUTION

- 3.01 Play Equipment:
- A. Install all equipment as per manufacturer's specifications and directions.

- B. Maintain dimensioned minimum setbacks as shown on plans and details between equipment and other edges or equipment.

END OF SECTION

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division - 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of ripping, fertilizing, soil conditioning and fine grading of topsoil in preparation for seeding, sodding, shrub beds or planting operations.
- 1.3 RELATED SECTIONS:
- A. Earthwork – Section 02200
 - B. Topsoil – Section 02925
 - C. Turfgrass Seeding – Section 02932
 - D. Native Seeding – Section 02933
 - E. Trees and Shrubs - 02950
- 1.4 SUBMITTALS:
- A. Quality Control Submittals:
 - 1. Certificates: State, federal and other inspection certificates shall accompany invoice for materials showing source or origin. Submit to Owner's Representative prior to acceptance of material.
 - 2. Material Analysis: Provide soil conditioner analysis performed no more than 3 months prior to delivery to site.
- 1.4 DELIVERY, STORAGE AND HANDLING:
- A. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark and conformance to state law, bearing name and warranty or producer. If fertilizers are delivered in bulk, supplier shall provide the same certification as above.
 - B. Notify Owner's Representative of delivery schedule in advance so material can be inspected upon arrival at project site. Immediately remove unacceptable material from project site.
- 1.5 PROJECT/SITE CONDITIONS:
- A. General: Do not perform work when climate and existing site conditions will not provide satisfactory results.

- B. Vehicular accessibility on site shall be as directed by the Owner's Representative. Repair damage to prepared ground and surface caused by vehicular movement during work under this section to original condition at no additional cost to the City.

PART 2: PRODUCTS

2.1 SOIL MATERIALS:

- A. Topsoil: Shall be as specified under Section 02925 - Topsoil.
- B. Soil Conditioner: Shall be Class 1 Compost by A1 Organics, 16350 WCR 76, Eaton, Colorado 80615 (970) 454-3492.

2.2 OTHER MATERIALS:

- A. Fertilizer: Diamonium phosphate (18-46-0).
- B. Post Emergent Herbicide: Roundup (Glyphosate) as manufactured by Monsanto Company or approved equal.

PART 3: EXECUTION

3.1 EXAMINATION:

- A. General: Verify that existing site conditions are as specified and indicated before beginning work under this Section.
 - 1. Grades: Inspect to verify rough grading is within +/- 0.1 foot of grades indicated and specified.
 - 2. Damaged Earth: Inspect to verify that earth rendered unfit to receive planting due to concrete, water, mortar, limewater or any other contaminant dumped on it has been removed and replaced with clean earth from a source approved by the Owner's Representative.
- B. Unsatisfactory Conditions: Report in writing to General Contractor with copy to Owner's Representative.
- C. Acceptance: Beginning of installation means acceptance of existing conditions by installer.

3.2 PREPARATION:

- A. Protection:
 - 1. Locate sewer, water, irrigation, gas, electric, phone and other pipelines or conduits and equipment prior to commencing work.

2. Be responsible for proper repair to landscape, utilities, walls, pavements and other site improvements damaged by operations under this section.
- B. Weed Control: Remove annual weeds by tilling. Remove perennial weeds by applying herbicide 1 week before soil preparation and as needed, but no sooner than 3 months before beginning work.
 - C. Surface Grade: Remove weeds, debris, clods and rocks larger than ½". Dispose of accumulated debris at direction of Owner's Representative.
 - D. Runoff: Take measures and furnish equipment and labor necessary to control the flow, drainage, and accumulation of water. Insure that all water will run off the grades.
 - E. Erosion Control: Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site throughout duration of work.

3.3 INSTALLATION:

- A. Soil Preparation in Turfgrass, Shrub Beds and Native Seed Areas:
 1. Evenly distribute soil conditioner and first application of fertilizer at the following rates:
 - a. Soil conditioner at the rate of 5 cu.yds. per 1,000 square feet for sodded areas, 3 cu yds. Per 1,000 square feet for seeded areas, 3 cu yds. Per 1,000 square feet for shrub beds.
 - b. 18-46-0 fertilizer at the rate of 4 lbs. per 1,000 square feet.
 2. After applying soil conditioner and fertilizer, thoroughly till area to depth of 6" minimum by plowing, harrowing, or disking until soil is well pulverized and thoroughly mixed.
- B. Fine Grading in all Landscape Areas:
 1. Do fine grading for all areas prior to seeding or planting.
 2. For ground surface areas surrounding buildings to be landscaped, maintain required positive drainage away from buildings.
 3. Establish finish grades to within 0.1 foot of grades indicated. Allow 1-1/2 inch for thickness of sod.
 4. Noxious weeds or parts thereof shall not be present in the surface grade prior to seeding.
 5. Prior to acceptance of grades, hand rake to smooth, even surface, free of debris, clods, rocks and vegetable matter greater than 0.5 inch.

3.4 NOTIFICATION AND INSPECTION:

- A. Inspection: Provide notice to Owner's Representative requesting inspection at

least seven (7) days prior to anticipated date of completion.

- B. Deficiencies: Owner's Representative will specify deficiencies to Contractor who shall make satisfactory adjustments and shall again notify Owner's Representative for final inspection.

3.5 CLEANING:

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

3.6 PROTECTION:

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

END OF SECTION 02920

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and other Division - 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of furnishing, stockpiling and placing topsoil on a previously prepared subgrade.
- 1.3 RELATED WORK:
- A. Earthwork: Section 02200
 - B. Soil Preparation: Section 02920
 - C. Turfgrass Seeding: Section 02932
 - D. Native Seeding and Mulching: Section 02933
 - E. Trees and Shrubs: Section 02950
- 1.4 QUALITY ASSURANCE: Submit soil analysis report for imported topsoil from the State University Agricultural Extension Service or other approved soil testing laboratory. Report shall cover soil textural classification (percentages of sand, silt, and clay), pH and include additive recommendations. Testing will be at the expense of the Contractor.
- 1.5 DELIVERY, STORAGE AND HANDLING: Do not deliver or place topsoil in frozen, wet, or muddy condition.

PART 2: PRODUCTS

- 2.1 ON-SITE TOPSOIL: Topsoil previously stripped and stockpiled under Section 02200.

PART 3: EXECUTION

- 3.1 PLACING TOPSOIL:
- A. Scarify compacted subgrade to a 6-inch depth to bond topsoil to subsoil. Place salvaged topsoil to a minimum depth of 4-inches after settlement. Topsoil shall be free from weeds, sod, clods and stones larger than 1-inch, toxic substances, litter or other deleterious material. Spread evenly and grade to elevations and slopes shown. Hand rake areas inaccessible to machine grading.

END OF SECTION 02925

PART 1: GENERAL

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and Division - 1 Specification sections apply to Work of this section.
- 1.2 SUMMARY:
- A. Work Included: Furnish and install bluegrass sod, and maintain sodded areas until Final Acceptance.
- B. Related Work:
1. Watering - Section 02233
 2. Irrigation System - Section 02810
 3. Soil Preparation - Section 02920
 4. Topsoil – Section 02925
 5. Trees and Shrubs - Section 02950
- 1.3 SUBMITTALS:
- A. Quality Control Submittals:
1. Certificates: State, Federal and other inspection certificates shall accompany the invoice for materials showing source or origin. Submit to Project Manager prior to acceptance of material.
 2. At least 10 working days before anticipated date of sod delivery, submit list of varieties contained in sod for approval by Project Manager.
- B. Contract Closeout Submittals:
1. Warranty: At completion of work, furnish written warranty to Owner based upon requirements as specified.
- 1.4 QUALITY ASSURANCE:
- A. Source Quality Control:
1. Sod Materials: Subject to inspection and acceptance. Project Manager reserves the right to reject at any time or place prior to acceptance, any work and sod which in the Project Manager's opinion fails to meet these specification requirements.
 2. Inspection: Primarily for quality; however, other requirements are not waived even though visual inspection results in acceptance. Notify Project Manager of intended sod farm prior to cutting for inspection. Inspection at growth site shall not preclude the right of rejection at project site.
 3. Promptly remove rejected sod from site.
 4. Inspection will be made periodically during sodding, at completion and at end of warranty period by Project Manager.

B. Sod Standards:

1. General: Healthy, thick turf having undergone a program of regular fertilization, mowing and weed control; free of objectionable weeds; uniform in green color, leaf texture and density; healthy, vigorous root system; inspected and found free of disease, nematodes, pests and pest larvae by the entomologist of the State Department of Agriculture.
2. Each piece of Sod: Sandy-loam soil base that will not break, crumble or tear during sod installation.
3. Thickness: Minimum 3/4" thick, excluding top growth and thatch.
4. Thatch: Not to exceed 1/2" uncompressed.
5. Size: Cut in strips 18" wide no more than 24 hours prior to delivery.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Sod: Deliver on pallets properly loaded on vehicles and with root system protected from exposure to sun, wind, and heat in accordance with standard practice and labeled with botanical and common name of each grass species in accordance with Federal Seed Act. Sod that has been damaged by poor handling or improper storage is subject to rejection by the Project Manager.

1. Protect from dehydration, contamination, freezing and heating at all times. Keep stored sod moist and under shade or covered with moistened burlap.
2. Do not drop sod rolls from carts, trucks or pallets.
3. Do not deliver more sod than can be installed within 48 hours.
4. Do not stack sod more than 2 feet deep.

B. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened container bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, warranty and conformance to state law.

1. Material shall be inspected upon arrival at job site.
2. Immediately remove unacceptable material from job site.

1.6 PROJECT/SITE CONDITIONS:

A. Existing Conditions:

1. Import and place any fill material required to adjust the fine grade to meet drainage requirements or to match hard surface finish grades.
2. Vehicular accessibility on site shall be as directed by Project Manager. Repair damage to prepared grounds and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to Owner.

B. Environmental Requirements:

1. If possible install sod between spring and fall: April 15 - October 1 or anytime irrigation is available daily for one month and once a week for several months (especially for fall/winter sodding).
2. Do not install sod on saturated or frozen soil.
3. Schedule work for periods of favorable weather. Sod placement on days which, in the opinion of the Project Manager, are too hot, dry or windy for optimal installation may be prohibited.

1.7 MAINTENANCE:

A. Substantial Completion:

1. The Project Manager will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
2. Acceptance of material by the Project Manager will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.
3. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Project Manager, the Project Manager will recommend that the Work of this Section be provisionally accepted.

B. Maintenance:

1. General: The maintenance period shall begin immediately after each area is sodded and continue until final acceptance of entire project or a minimum of 30 days, whichever is later. During this time, Contractor shall be responsible for watering, mowing, spraying, weeding, aerating, fertilizing, and all related work as necessary to ensure that sodded areas are in a vigorous growing condition. Furnish all supervision, labor, material and equipment to maintain turf areas.
2. Materials: Conform to specification or otherwise be acceptable to Project Manager.
3. Watering: Initially water sod upon completion of convenient work areas until installation is complete and the irrigation system can be operated under full control. Water sod sufficiently to moisten subsoil at least 4" deep in a manner not to cause erosion or damage to adjacent finished surfaces. Water shall be free of substances harmful to plant growth. Be responsible for furnishing water from underground sprinkler system, quick couplers or other source.
4. Fertilizing: Within 30 days of sodding and every 30 days thereafter until final acceptance, apply specified fertilizer to maintain optimal sod vigor.
5. Mowing and Trimming: Mow and Trim around trees (keeping mulch in saucers and beds), walls, fences, etc., maintaining turf at 2½"-2-¾" height. Do not remove more than 33% of grass leaf in single mowing. Remove grass clippings from pavement areas.

6. Resodding: Resod spots larger than 1 sq. ft. not having healthy, uniform stand of grass.
 7. Weed Control: As required, using selective herbicides approved by Project Manager.
 8. Insect and Disease Control: As required, using insecticides and fungicides approved by Project Manager.
- C. Final Acceptance:
1. At the end of the Maintenance Period, the Project Manager will, upon written notice of end of Maintenance Period, inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.
 2. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Project Manager at that time, the Project Manager will recommend that Final Acceptance of the Work of this Section be given.
 3. Sod areas will be accepted when in compliance with all the following conditions:
 - a. Roots are thoroughly knit to the soil.
 - b. Absence of visible joints.
 - c. All areas show a uniform stand of specified grass in healthy condition, free of weeds, diseases and other visible imperfections.
 - d. At least 30 days have elapsed since the completion of Work under this Section.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Sod: A-34 Sports Turf. Available thru Grafts Turf Farm, Ft. Morgan, Colorado, 1-800-280-TURF.
- B. Water: Free of substances harmful to plant growth. Be responsible for furnishing water from underground sprinkler system, quick couplers or other source.
- C. Fertilizer: Inorganic mixture with following chemical composition: 20-5-10 with 50% sulfur coated urea (no iron).

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. General - Verify that existing site conditions are as specified and indicated before beginning work under this section.
 1. Layout: Verify layout of sodded areas as indicated prior to starting operations.

2. Grades: Verify that grades are within 0.04 ft. of grades indicated and specified.
- B. Unsatisfactory Conditions: Report in writing to General Contractor with copy to Project Manager.
 - C. Beginning of installation means acceptance of existing conditions by this Contractor.

3.2 PREPARATION:

- A. Protection:
 1. Be responsible for proper repair to landscape, utilities, walls, pavements, and other site features damaged by operations under this section.
 2. Identify prepared sod areas requiring protection and erect barriers for proper protection and traffic control.
- B. Sodded Areas: Remove weeds, debris and rocks larger than ½". Dispose of accumulated debris at direction of Project Manager.
- C. Repair: Re-establish grade and specified conditions to damaged sod areas prior to placing sod.
- D. Adjustment: Adjust irrigation heads to proper watering height according to depth of sod material but lower than compacted blade height to enable lawn mowers to cut grass freely without damage to the sprinkler system.
- E. Fine Grading: Perform as required to maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc., and as required to provide smooth well-contoured surface prior to proceeding. Tolerance: ± 0.04 foot.

3.3 SODDING:

- A. Sodding:
 1. Soil on which sod is laid: Slightly moist.
 2. Lay with longest dimension parallel to contours and in continuous rows.
 3. Tightly butt ends and sides of sod together. Stagger and compact vertical joints between sod strips by rolling so sod will be incorporated with the ground surface, insuring tight joints between adjacent pieces. Ensure that sod is neither stretched nor overlapped.
 4. Exposed joints due to shrinkage will require replacement of sod in affected areas.
- B. Topsoil: Add along exposed edges to match adjacent grade. Feather topsoil out approximately 1 ft. from edge of sod. Broom screened topsoil over entire sodded area to fill voids but do not smother sod.

- C. Rolling: When soil and sod are moist, roll sod lightly as soon as possible after it is laid. Roller shall weigh 100 to 160 lb per foot of roller. Delay rolling until just before the second watering.
- D. Drainage: Assure that finished areas of sod are such that positive drainage of storm and irrigation water will occur and ponding of water will be minimized.
- E. Watering: Thoroughly water sod immediately after laying to a depth sufficient that the underside of the new sod strips and soil below the sod are thoroughly wet.

3.4 FERTILIZING:

- A. Fertilizer Applications: Distribute 20-5-10 fertilizer uniformly at the rate of 1 lb. actual nitrogen per 1,000 SF (or 5 lbs. of material per 1000 SF) 30 days after sodding and every 30 days thereafter until Final Acceptance of project by Project Manager.

3.5 REPAIR OF EXISTING LAWN AREAS DISTURBED BY RENOVATION:

- A. Repair existing lawn areas disturbed by renovation work (utilities, paving, etc) as indicated, in accordance with specifications of this section.

3.6 CLEANING:

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

3.7 PROTECTION:

- A. General: Provide and install barriers as required and as directed by Project Manager to protect sodded areas against damage from pedestrian and vehicular traffic until Final Acceptance.

END OF SECTION 02935

PART 1 - GENERAL**1.1 RELATED DOCUMENTS:**

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

1.2 SUMMARY:

- A. This Section includes the following:
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
 - 5. Stakes and guys.
 - 6. Landscape edging.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Soil Preparation – Section 02920
 - 2. Topsoil – Section 02925
 - 3. Turfgrass Seeding – Section 02932
 - 4. Native Seeding and Mulching – Section 02933

1.3 SUBMITTALS:

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Delivery tickets for all bulk materials with Owner's Representative's approval or acknowledgment that materials were received in satisfactory condition.
- C. Product certificates signed by manufacturer certifying that their products comply with specified requirements.
 - 1. Manufacturer's certified analysis for standard products, where applicable.
 - 2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 - 3. Label data and cut sheets substantiating that landscape materials, including all soil amendments, herbicides, and pesticides, comply with specified requirements.
- D. Samples of each of the following:
 - 1. 1 cubic foot of mulch for each mulch type required for Project, in labeled plastic bags, boxes, or buckets.
 - 2. Edging materials and accessories.
 - 3. Weed barrier.

4. Soil amendments.
 5. Staking and guying materials.
 6. All items requested by Contractor for Substitution or as an Approved Equal.
- E. Qualification data for firms and persons specified in the "Quality Assurance" article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects, owners, and other information specified.
 - F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 1. Analysis of existing surface soil for plant growth.
 2. Analysis of imported topsoil for plant growth.
 3. Analysis of well and non-potable water sources for watering plant material.
 - G. Planting schedule indicating anticipated dates and locations for each type of planting.
 - H. Three (3) sets maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.
 - I. Three (3) copies of a written warranty stating all items included in the warranty, conditions of the warranty, and beginning and ending of warranty period(s).

1.4 QUALITY ASSURANCE:

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Landscape Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock", and all applicable state and local rules and regulations.
- D. Inspection: Landscape Architect may inspect plants either at place of growth or at site before planting, for compliance with requirements for name, variety, size, and quality.

1. The Landscape Architect reserves the right to reject at any time or place prior to final acceptance all plant materials which, in the Landscape Architect's opinion fail, to meet specifications. Inspection of materials is primarily for quality, size, and variety, but other requirements are not waived even though visual inspection results in approval. Plants may be inspected where available; however, inspection at the places of supply shall not preclude the right of rejection at the site or at a later time prior to final acceptance. Rejected material shall be removed from the site within 24 hours.
 2. The Contractor shall schedule inspection of the plants, at either the supplier or on site, to be completed in one visit. Any further inspection required due to plants being unavailable or rejected as not meeting specifications shall be charged to the Contractor at the current hourly rate for Landscape Architect's personnel performing the inspection.
- E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6-inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12-inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- F. Pre-installation Conference: Contractor shall attend pre-installation conference at locations specified by Owner's Representative.
- G. U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act: quality standards for Certified Seed.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. The Landscape Architect reserves the right to inspect containers before or after installation to verify compliance with Specifications.
- B. Trees and Shrubs: Deliver nursery stocked or freshly dug trees and shrubs. Do not prune before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Plant materials delivered without protective covering may be rejected. Do not drop trees and shrubs during delivery. Label at least one tree and one shrub of each variety with a securely attached waterproof tag bearing a legible plant name. Remove all tags and flagging as directed by Landscape Architect.
1. Immediately after digging bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- C. Handle balled and burlapped stock by the root ball.

- D. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS:

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned. Contractor shall be responsible for utility locating, repair of utilities damaged by Contractor, and establishment of grade controls.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.
- C. Clearing and Grubbing: Applies to all contract work areas which have vegetation or weed growth of 2-inch height or greater, and which are designated to be topsoiled, amended, seeded, sodded, and/or planted under this Contract.

1.7 COORDINATION AND SCHEDULING:

- A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.
- B. Plant trees and shrubs after final grades have been accepted and prior to planting turf and native grasses, unless authorized by Owner's Representative.

1.8 WARRANTY:

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the following living planting materials for a period of one (1) year after date of Final Acceptance, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

1. Trees.
 2. Shrubs.
 3. Ground covers, vines, and perennials.
- C. Replace planting materials that are excessively pruned, more than 25 percent dead, or in an unhealthy or declining condition immediately upon notice from the Owner's Representative.
- D. All plants shall be true to name and meet all conditions of these specifications. Any plant which is not true to name as indicated by form, leaf, flower, or fruiting characteristics shall be replaced at the Contractor's expense.
- E. Inadequate or improper maintenance by the Owner shall not be cause for replacement, provided the Contractor shall have submitted a letter or report to the Owner on improper or inadequate maintenance practices and recommended remedial actions.
- F. The warranty shall not be enforced should any plant die due to vandalism after final acceptance.

1.9 TREE, SHRUB, GROUND COVER AND PLANT MAINTENANCE:

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

PART 2 - PRODUCTS

2.1 PLANT MATERIALS:

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, girdling, and defects such as sun scald, injuries, abrasions, and disfigurement.
- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect with a proportionate increase in size of roots and balls.
- C. Label each plant with securely attached waterproof tag bearing legible designation of botanical and common name.

- D. Label at least 1 plant each variety and caliper with a securely attached waterproof tag bearing legible designation of botanical and common name.
- E. All plants shall be the species designated on the Drawings. No substitutions will be accepted without the prior written approval of the Landscape Architect. Contractor must provide proof of non-availability.

2.2 TREES:

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.
 - 1. Branching Height: 1/3 to 1/2 of tree height.
 - 2. Branching Height: 1/2 of tree height.
- B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as designated on Drawings.
- C. Evergreen Trees: Specimen quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- D. Provide balled and burlapped trees.
- E. All deciduous trees of one species used in formal rows or groupings shall exhibit cultural uniformity, i.e. "matched" in height, crown width and shape, height to first branch, and trunk taper. For this reason it is desired that these trees be produced by a single grower.

2.3 SHRUBS:

- A. Form and Size:
 - 1. Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub. Root development shall be sufficient to hold soil in the shape of the container when removed, but without visible circling roots.
 - 2. Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide container-grown shrubs.

2.4 GROUND COVERS, PERENNIALS, AND VINES:

- A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

2.5 TOPSOIL:

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7.0, 4 percent organic material minimum, free of stones 1-inch or larger in any dimension, refuse, plants or their roots, sticks, noxious weed seeds, salts, sterilants, or other material which would be detrimental to plant growth. Topsoil shall have salts of less than 2 mmhos/cm and a sodium absorption ratio of less than 12.

2.6 SOIL AMENDMENTS: See Section 02920

2.7 FERTILIZER: See Section 02920

2.8 MULCHES:

- A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following.:
 - 1. Type: Fir Fiber Mulch as supplied by Direct Landscape Supply, Englewood, Colorado, 303-781-2270; Wes Moser & Sons, Inc., Ft. Lupton, Colorado, 303-659-9663; or an approved equal.

2.9 WEED-CONTROL BARRIERS:

- A. Non-woven Fabric: Spunbond Polyester fabric, 3.7 oz. per sq. yd., minimum permeability of 160 gal. per min. ft./2; Polyspun XL supplied by Direct Landscape Supply, Englewood, Colorado, 303-781-2270, or an approved equal.

2.10 STAKES AND GUYS:

- A. Upright Stakes: Green 6-foot steel tee posts with bottom blade and white painted top.
- B. Guy and Tie Wire: 12 gauge galvanized wire. All guy and tie wires shall be covered with 1-inch diameter PVC pipe, white.
- C. Tree Collar Nylon Strap: Minimum 2-inch wide non-stretch webbing with grommets for attachment of wire between strap and stake.
- D. Hose Chafing Guard: Reinforced rubber or plastic hose at least ½-inch (13-mm) in diameter, cut to lengths required to protect tree trunks from damage.
- E. Evergreen trees that are 8-feet tall or taller shall have wire guys looped through grommets nylon strap sections which are looped around the tree trunk and secured to 30- inch long metal tee posts. Fabric tree collar strap will not be acceptable on evergreen trees taller than 8-feet.

2.11 LANDSCAPE EDGING:

- A. Steel Edging: Ryerson steel edging, 4-inch depth, 3/16-inch thick, with line stakes and splicer stakes as recommended by manufacturer. Color: Green

2.12 MISCELLANEOUS MATERIALS:

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.
- B. Pre-Emergent Herbicide: Treflan as manufactured by Elanco Company, or an approved substitution.
- C. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inches (102-mm) wide minimum, with stretch factor of 33 percent.
- D. Herbicides and Pesticides: EPA registered and approved, of type recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FINISH AND FINE GRADING:

- A. Tillable Soil: Mechanically rip or disk subsoil in all areas to be planted to a minimum depth of 6-inches prior to placing top soil and soil amendments.
- B. Positive Surface Drainage: Finish and fine grade the project area to establish an even and well matched gradient over the entire surface. Provide positive surface drainage, with no depressions, settling, or irregularities in the finished grade.
- C. Transitional Areas: At any transitional point or line where one plane intersects another, such as from a sloping area or berm to a level area, a smooth and gentle transition shall be made. There shall be no abrupt changes in grade unless specifically noted otherwise. Match the grades of new work with existing areas outside the project area.

3.3 SOIL TESTING:

- A. The Contractor shall perform soil tests 30 days prior to mobilizing for Landscape Construction.
- B. Soil testing shall be provided by Colorado Analytical Laboratory, 240 S. Main Street, Brighton, CO 80601, (303) 659-2313, or an approved testing facility. Soil shall be tested for soluble salts and nutrient levels. Testing facility shall provide interpretation of results and recommendation for soil amendments for each type of planting.

- C. Soil test shall be performed for all stockpiled topsoil. Provide a separate test for each 50 cubic yards of topsoil.
- D. Soil test shall be performed for all imported topsoil. Provide a separate test for each 50 cubic yards of topsoil.
- E. Deficient nutrients shall be corrected with the addition of appropriate fertilizer and amendment materials. The Contractor shall submit a Change Order Request for all additional materials that are recommended but are not included in this Specification.

3.4 PREPARATION:

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Landscape Architect's acceptance before the start of planting work. Make adjustments as directed.

3.5 WEED CONTROL:

- A. In areas that have been regraded and/or have existing weed growth, weed control measures appropriate to the amount of growth and/or species shall be provided. Submit weed control plan to Owner's Representative for approval.
- B. Clear and grub, apply pre-emergent herbicide, and/or apply post emergent herbicide as necessary to eliminate weeds. Do not proceed with Landscape work until weed growth has been controlled.

3.6 PLANTING SOIL PREPARATION:

- A. Clean topsoil of roots, plants, sod, stones, lumps, and other material harmful to plant growth and the appearance of a smooth finish grade.
- B. Spread topsoil evenly over entire project area to be planted or seeded.
 - 1. Spread a minimum of 4-inches of amended topsoil.
- C. Spread amendments and fertilizers at rates indicated:
 - 1. Shrub, and Ground Cover Beds: Provide not less than the following quantities of specified amendments:

Specified Organic Matter: 3 Cubic Yards /1000SF
 Commercial Fertilizer: (20-10-5): 10 lbs./1000 SF
 Superphosphate: 10 lbs./1000 SF

3.7 EXCAVATION FOR TREES AND SHRUBS:

- A. Planting Pits: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Roughen sides of planting pit.
 - 1. Bare-Root Trees and Shrubs: Excavate at least 12-inches (300-mm) wider than root spread and deep enough to allow setting of roots on a layer of planting soil and with collar set at same grade as in nursery, but 1-inch (25-mm) below finish grade, unless otherwise indicated.

2. Balled and Burlapped Trees and Shrubs: Excavate approximately 2 times as wide as ball diameter. The depth of the plant pit shall be 2-inches less than the depth of the ball in well drained soils and 4-inches less than the ball depth in poorly drained soils.
 3. Container-Grown Trees and Shrubs: Excavate approximately 2 times as wide as ball diameter. The depth of all plant pits shall be 1-inch less than depth of ball.
 4. Where drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.
- B. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavation.
- C. Drainage: Notify Owner's Representative if subsoil conditions evidence water seepage or retention in tree or shrub pits.
1. Fill the pit with water and allow it to completely drain before planting occurs.
 2. If water does not drain out of pit within 24 hours, notify Owner's representative.

3.8 PLANTING TREES AND SHRUBS:

- A. Set balled and burlapped stock plumb and in center of pit with top of ball raised above adjacent finish grades as indicated.
1. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
 2. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately ½ backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- B. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
1. Carefully remove containers so as not to damage root balls.
 2. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately ½ backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- C. Set bare-root stock on cushion of planting soil. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots. Remove injured roots by cutting cleanly; do not break.
1. Set collar 1-nch (25-m) below adjacent finish grades, unless otherwise indicated.

- D. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.
- E. Wrap trees with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.
 - 1. No tree shall be wrapped after May 21 nor before November 1.
 - 2. All deciduous trees shall be wrapped by November 15. Remove tree wrap by May 15.
 - 3. Contractor shall be responsible for wrapping and unwrapping trees during the warranty period.

3.9 TREE AND SHRUB PRUNING:

- A. Prune, thin, remove injured or dead branches, and shape trees and shrubs as directed by Landscape Architect.

3.10 STAKING:

- A. Stake trees per following schedule, then remove at end of first growing season:
 - 1. 1-1/2" Caliper Size – minimum 1 stake on side of prevailing wind (generally N.W. side).
 - 2. 1-1/2" – 3 Caliper Size – minimum 2 stakes, one on N.W. side and one on S.W. side.
 - 3. 3" Caliper Size and Larger – 3 stakes per diagram.

Wire or cable shall be a minimum 12-gauge. Tighten wire or cable only enough to keep from slipping. Allow for some trunk movement. Nylon straps shall be long enough to accommodate 1-1/2" of growth and buffer all branches from wire.

Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire fed through white PVC pipe and tree collar grommets. Allow enough slack to avoid rigid restraint of tree. Twist ends of wire and trim off excess.

- B. Guying and Staking: Guy and stake evergreen trees exceeding 8-feet and deciduous trees more than 5-inch caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30-inches (760-m) long, driven to grade. Feed guy wire through white PVC pipe and hose chafing guard.
- C. Cover tie and guy wires with 1-inch white PVC pipe.

3.11 PLANTING GROUND COVER AND PLANTS:

- A. Space ground cover and plants as indicated
- B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.12 MULCHING:

- A. Mulch backfilled surfaces of pits, planted areas, non-irrigated zones, and other areas indicated.
- B. Pre-Emergent Herbicide: Apply pre-emergent herbicide to all shrub bed areas at the rate recommended by the manufacturer. Do not apply to annual, perennial, or ground cover areas.
- C. Weed-Control Barriers: Install weed-control barriers according to manufacturer's recommendations, before mulching. Completely cover area to be mulched, lapping and pinning edges a minimum of 6-inches (150-mm).
- D. Organic Mulch: Apply the following average thickness of mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
 - 1. Thickness: 3-inches (75-mm) deep in shrub bed areas.
- E. Mulch tree rings in turf and native grass areas with 3-inch depth specified organic mulch.
- F. Mulch evergreen trees in turf out to dripline with 3-inch depth specified organic mulch.

3.13 INSTALLATION OF EDGING:

- A. Edging: Install steel edging where indicated according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 30-inches (760-mm) apart, driven below top elevation of edging.

3.14 INSTALLATION OF MISCELLANEOUS MATERIALS:

- A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
 - 1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again 2 weeks after planting.

3.15 MAINTENANCE:

- A. Maintain all plantings until final acceptance, including watering, pruning, and all other activities associated with proper maintenance.

3.16 CLEANUP AND PROTECTION:

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS:

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

END OF SECTION 02950

PART 1 – GENERAL

- 1.1 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, and Division - 1 Specification sections, apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of landscape maintenance of irrigation system, sodded areas, trees, ground cover and sweeping of all pavement areas and parking lots.
- 1.2 RELATED WORK:
- A. Irrigation - Section 02810
 - B. Trees and Shrubs - Section 02950
 - C. Turfgrass Seeding - Section 02932
- 1.3 SUBMITTALS:
- A. Notices - Submit the following written notices to the Owner.
 - 1. At initiation of work under this contract, a listing of unhealthy plant materials, safety hazards, problem areas, or other conditions not in conformance with the safe and pleasing environment.
 - 2. A minimum of one (1) week prior to the start-up or winterization of the irrigation system.
 - 3. A minimum of one (1) week prior to fertilization or the broad application of any chemicals or insecticides of any kind.
 - 4. A minimum of one (1) week prior to the end of the maintenance period.
- 1.4 QUALITY ASSURANCE:
- A. Applicable Codes and Standards.
 - 1. Abide by the codes, specifications, and standards of all governmental and industry regulations including but not limited to City, County, State of Colorado, and the standards of the American Association of Nurserymen (ANN), American Society for Testing and Materials (ASTM), National Plumbing Code (NPC), Colorado Technical Plumbing Code, Uniform Building Code (UBC), Sprinkler Irrigation Association (SIA), National electric Code (NEC), American Sod Producers Association (ASPA), United States Department of Agriculture (USDA), and the Association of American Seed Control Officials (AASCO).
 - 2. All labor shall be United States citizens or have current, valid work permits for work within the United States.
 - 3. At all times when work is being performed, Contractor shall have an individual who has successfully completed the Standard First Aid and Personal Safety Course (intermediate level) offered by the American Red Cross or other training as accepted by the Owner.
 - 4. No chemicals or fertilizers shall be utilized on the work without a state

licensed operator in attendance.

- B. Acceptance:
 - 1. On or before the expiration of the maintenance period, the Owner and the Contractor shall conduct a final inspection of the work. The Owner shall prepare a list of any defects discovered during such final inspection ("punch list") and submit the punch list to the Contractor. Any additional defects discovered subsequent to the final inspection of the work, but prior to the date of final acceptance (as hereinafter defined) shall also be submitted to the Contractor for repair at the cost and expense of the Contractor. Upon completion by the Contractor of the terms contained on the punch list and any other items subsequently discovered prior to the date of Final Acceptance, the Owner shall deliver a written notice of Final Acceptance to the Contractor.

- C. Equipment:
 - 1. All equipment shall be well maintained and equipped with current safety features including audible reverse warning, trimming guards, etc.

1.5 MAINTENANCE PERIOD:

- A. Require full maintenance for all items (sodded areas, tree care, mulching, winter watering, sweeping, etc.) shall extend until final acceptance of the project.

PART 2 - PRODUCTS Not applicable.

PART 3 - EXECUTION

3.1 IRRIGATION SYSTEM:

- A. Start Up:
 - 1. The Contractor shall be responsible for the start-up of the automatic irrigation system, unless modified by extreme weather conditions, the system shall be activated not before April 1 and not later than April 30, or as reclaimed water is available.
 - 2. To activate system, pressurize and then run each zone a minimum of 15 minutes. Each zone shall be observed for leaks, pressure defects, adequate coverage, and other conditions which shall impact the effective operations of the system. Any leaks or defects shall be corrected immediately.

- B. Controller Settings:
 - 1. Properly program the irrigation controller to insure adequate but not excessive watering throughout the year.

- C. Testing System:
 - 1. At a minimum of once each month between May and October, manually operate each and every irrigation zone to insure continued and adequate coverage, pressure, and the absence of leaks. All system leaks or defects shall be corrected immediately.

- D. Winterization:
1. The Contractor shall be responsible for the winterization of the automatic irrigation system. Unless modified by extremely mild weather conditions, the system may be shut down and winterized by November 25. The requirement shall remain in effect even if the Owner has accepted the project.
 2. In the week immediately prior to closing of the system, all landscape areas shall receive a minimum of 1.5" of watering (either through natural conditions or through operation of the system).
 3. Winterize the system by closing the main pressure valve opening, all stop and waste valves, removing water from the lines, de-energizing the controller, and all other actions deemed prudent. Remove water from drip lines by opening flushing points and blowing out all water.

3.2 SODDED AREAS:

- A. General: The maintenance period shall begin immediately after each area is sodded and continue until final acceptance of entire project. During this time, be responsible for watering, mowing, spraying, weeding and all related work as necessary to ensure that seeded areas are in a vigorous growing condition. Provide all supervision, labor, material, and equipment to maintain seeded areas.
- B. Materials: Conform to specifications or otherwise be acceptable to Owner.
- C. Watering: Water sodded areas at regular schedule to be accepted by Owner's Representative until stand of grass is established. Water in repeated short time periods. After grass is established, water irrigated grass at a regular schedule to be accepted by Owner. .
- D. Fertilization: Native Seed/Dryland Grasses - None required.
- E. Fertilization: Bluegrass
1. Fertilize all seeded areas after second mowing.
 2. Fertilizer shall be a Urea based only mixture with the following chemical composition: 46 percent nitrogen, 0 percent phosphorous, and 0 percent potash. All applications shall be at a rate of 5 lbs. nitrogen per 1000 sq.ft.
 3. These feedings are specifically in addition to those required by the installation specification.
 4. All fertilizer applications shall occur using a commercial spreader on a calm, dry morning. The sod should be moist. Never fill the spreader over the lawn areas or when "on". Sweep all concrete and asphalt areas that may have been pelleted with fertilizer.
 5. In addition to the lawn fertilization, one (1) application of elemental iron shall be made at a rate of 0.5 lbs. per 1000 sq.ft, or as indicated by soil testing.
- F. Weeding and Insect Toxins: No application of week killer, insecticides, or antifungal chemicals are specifically specified. If required, apply these elements as necessary to maintain healthy, weed free sod throughout the year. Apply as per manufacturer's recommendations whenever necessary to protect the sod condition.
1. In the event of the application of these chemicals applies to more than 33 percent of the sod area, a notice of the time of application shall be posted

- on-site.
 - 2. Take all precautions when applying weed killers, insecticides or antifungal remedies, including gloves, masks, goggles, etc., and shall not apply on windy or rainy days.
 - 3. This section includes insects, molds, fungus, broadleaf, and viney weeds and specifically includes grasshoppers.
- G. Cutting: Cut bluegrass turf with a reel or rotary type mower. Keep grass an average of 2-1/2" in height and cut whenever the clippings will measure approximately 0.5 inch of 25 percent of the grass plant. Never cut off more than 33 percent of the plant height. Between May 1 and September 15, cut grass a minimum of once every week.
- 1. Remove all clippings immediately. Cross slope all mowing. All areas around walks, shelters, curbs, walls, rocks, plants, lights or other structures must be trimmed by hand or mechanical trimmer each time the grass is cut.
- H. Weed Control: As required, using selective herbicides approved by Owner's Representative.
- I. Insect and Disease Control: As required, apply insecticide and fungicide approved by Owner's Representative.

3.3 TREE AND SHRUB CARE:

- A. Maintenance crew shall inspect the plant material on a monthly basis. A written report of problems shall occur after each inspection.
- B. Immediately remove any dead plant or dead part of the plants. Maintenance crew shall remove all tree suckers and leafing on main stems.
- C. Each spring, no later than June 1, shall trim all winter dieback, undesirable shoots, and correct branching problems.
- D. Replace at no cost to the Owner any plant material which dies due to failure to comply with this specification or negligence or insect damage. This guarantee also applies to trees which are damaged due to maintenance crew's mowing operations.
- E. Remove tree stakes, tree guys, guy wires and tree wrap prior to completion of one (1) year warranty period.

3.4 WINTER WATERING:

- A. Contractor's maintenance crew to water all plant material areas once each month during December, January, February and March unless the Owner has accepted the project.
- B. The Contractor shall utilize a water truck.

3.5 SWEEPING:

- A. Contractor shall sweep pavement areas (walks, paths, plazas, etc) a minimum of once a week. Parking lots shall be swept once a month.

END OF SECTION 02970

PART 1 - GENERAL

- 1.1 DESCRIPTION: The work of this section consists of furnishing and placing concrete except for concrete as described in Section 02515 - Concrete walks.
- 1.2 RELATED WORK:
- A. Concrete walks and Curbs - 02520
 - B. Earthwork - 02200.
- 1.3 RELATED DOCUMENTS:
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 1.4 SUMMARY:
- A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
 - B. Cast-in-place concrete includes the following:
 - 1. Foundations and footings.
 - 2. Retaining walls.
- 1.5 SUBMITTALS:
- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
 - B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, dry-shake finish materials, and others if requested by Owner's Representative.
 - C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.
 - D. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.

1. Owner's Representative's review is for general design applications and features only. Designing formwork for structural stability and efficiency is Contractor's responsibility.
- E. Samples of materials as requested by Owner's Representative, including names, sources, and descriptions, as follows:
 1. Color finishes.
 2. Normal weight aggregates.
 3. Form liners, one square foot
 4. Thorocoat
- F. Laboratory test reports for concrete materials and mix design test.

1.6 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Testing Service: By Owner.
- C. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.
- D. Mockup: Cast mockup of size indicated or as required to demonstrate typical joints, form tie spacing, and proposed surface finish, texture, and color. Maintain sample panel exposed to view for duration of Project, after Owner's Representative's acceptance of visual qualities.
 1. Demolish mockup and remove from site when directed by Owner's Representative.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Forms for Textured Finish Concrete: Shall be Phoenix Limestone #P/C 30601 or equal. Provide solid backing and form supports to ensure stability of textured form liners. Manufactured by Symons Corporation 200 E. Touhy Ave., des Plaines, IL 60018, (708)298-3200.
- D. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches (38 mm) to the plane of the exposed concrete surface.
 - 1. Provide ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in the concrete surface.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A 615 Grade 60 (ASTM A 615M Grade 400), deformed.
- B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric (6 x 6, 18 gauge).
- C. Deformed-Steel Welded Wire Fabric: ASTM A 497.
- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

2.3 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Use one brand of cement throughout Project unless otherwise acceptable to Owner's Representative.
- B. Fly Ash: Not applicable.
- C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
 - 2. Coarse Aggregate: Maximum size, 3/4 inch complying with ASTM C33-90.
- D. Water: Potable.
 - 1. Polystrand, Metalcrete Industries
- E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Air-Tite, Cormix Construction Chemicals.
 - b. Air-Mix or Perma-Air, Euclid Chemical Co.
 - c. Darex AEA or Daravair, W.R. Grace & Co.
 - 2. Total Average Air Content: 5 to 7 percent.
- G. Other admixtures complying with ASTM C 494-90 or c 618-91 may be used with approval of Contracting Officer. Calcium chloride or admixtures containing more than, 0.5 percent chloride ions are prohibited.

2.4 RELATED MATERIALS:

- A. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick (0.76 mm) with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.
- B. Expansion Joint Fillers: Pre-molded type, ASTM D1751-83. Size, 1/2 inch by depth of slab.
- C. Water-Based Acrylic Membrane 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.
 - 2. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Highseal, Conspec Marketing and Mfg. Co.
 - b. Sealco - VOC, Cormix Construction Chemicals.
 - c. Safe Cure and Seal, Dayton Superior Corp.
- D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aquafilm, Conspec Marketing and Mfg. Co.
 - b. Eucobar, Euclid Chemical Co.
 - c. E-Con, L&M Construction Chemicals, Inc.

2.5 PROPORTIONING AND DESIGNING MIXES:

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Owner's Representative for preparing and reporting proposed mix designs.
 - 1. Do not use the same testing agency for field quality control testing.
 - 2. Limit use of fly ash to not exceed 25 percent of cement content by weight.
- B. Submit written reports to Owner's Representative of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Owner's Representative.
- C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:
 - 1. 4000 psi (27.6 MPa), 28-day compressive strength; water-cement ratio, 0.44 maximum (non-air-entrained), 0.35 maximum (air-entrained) for slabs on grade. Minimum cement content: 6 sacks per cubic yard.
 - 2. 3000 psi (20.7 MPa), 28-day compressive strength; water-cement ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained) for foundations, footings and walls. Minimum cement content: 5.5 sacks per cubic yard.
- D. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
 - 1. Subjected to freezing and thawing: W/C 0.45.
- E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Flatworks, ramps, slabs, and sloping surfaces: Not more than 4 inches (75 mm).
 - 2. Reinforced foundation systems: Not less than 1 inch (25 mm) and not more than 4 inches (100 mm).
 - 3. Other concrete: Not more than 4 inches (100 mm).
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Owner's Representative. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Owner's Representative before using in Work.

2.6 CONCRETE MIXING:

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
 - 1. When air temperature is between 85 degrees F (29 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

2.7 FORMLINER:

- A. Formliner to be "Stone Ground Granite", fractured pattern by Symons Corporation 847) 298-3200.

2.8 THOROCOAT:

- A. Thorocoat to be #440-M Silver Fox by ChemRex, Inc. 1-800-433-9517.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Coordinate the installation of joint materials and other related materials with placement of forms and reinforcing steel.

3.2 FORMS:

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
 - 1. Provide Class A tolerances for concrete surfaces exposed to view.
 - 2. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly buttjoints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 PLACING REINFORCEMENT:

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Owner's Representative.
- D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. 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.

3.4 JOINTS:

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Owner's Representative.
- B. Provide keyways at least 1-1/2 inches (38 mm) deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

- E. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth, unless otherwise indicated.
 - 1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
 - 2. Joint fillers and sealants as specified.

3.5 INSTALLING EMBEDDED ITEMS:

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Install dovetail anchor slots in concrete structures as indicated on drawings.
- C. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.6 PREPARING FORM SURFACES:

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
 - 1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.7 CONCRETE PLACEMENT:

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

- D. **Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators 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 set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. **Placing Concrete Slabs:** Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.
- F. **Cold-Weather Placement:** Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C) and not more than 80 degrees F (27 degrees C) at point of placement.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- H. **Hot-Weather Placement:** When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F (32 degrees C). Mixing water may be chilled 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 reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Owner's Representative.

3.8 FINISHING FORMED SURFACES:

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, or another similar system. 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. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than 1 day after form removal.
 1. 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.
- D. 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 MONOLITHIC SLAB FINISHES:

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes 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. During or after the first floating, check planeness of surface with a 10-foot straightedge applied at not less than two different angles, and then cut down all high spots and fill all low spots to achieve a true plane within 1/4 inch in 10 feet. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view as indicated. Float finish slab as described above, then steel trowel by machine or by hand. Additionally trowelings shall be done by hand after the surface has hardened sufficiently. Final troweling shall produce a ringing sound from the trowel and texture, and appearance shall be planed to the tolerance specified under Floated Finish.
- C. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete as indicated.
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Owner's Representative before application.

3.10 CONCRETE CURING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
1. Keep concrete surface continuously wet by covering with water.
 2. Use continuous water-fog spray.
 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4 inch (100 mm) lap over adjacent absorptive covers.

- E. Provide moisture-retaining cover curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches (75 mm) and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.11 REMOVING FORMS:

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

3.12 REUSING FORMS:

- A. 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-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Owner's Representative.

3.13 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Owner's Representative.
- B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh (1.2 mm) sieve, using only enough water as required for handling and placing.
 - 1. Cut out honeycombs, rock pockets, voids over 1/4 inch (6 mm) in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch (25 mm). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
 - 2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas 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.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION:

- A. General: The Contractor will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by Owner's Representative.
 - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F (4 degrees C) and below, when 80 degrees F (27 degrees C) and above, and one test for each set of compressive-strength specimens.
 - d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. (4 cu. m) plus additional sets for each 50 cu. yd. (38 cu. m) more than the first 25 cu. yd. (19 cu. m) of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - 2. When frequency of testing will provide fewer than five (5) strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Owner's Representative may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
- C. Test results will be reported in writing to Owner's Representative, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class,

location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, 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.

END OF SECTION 03300



Geotechnical Engineering Report
Monaco Park Renovation
NE Corner of E 56th Avenue and Monaco Street
Commerce City, CO 80022

DHM Design
900 S Broadway
Denver, CO 80209

Attn: Mr. Bill Neuman

ADDRESS	PHONE	FAX	WEB
5371 Magnolia Street, Commerce City, CO 80216	720.230.1931	720.230.5471	info@triaxgeo.com

April 14, 2023

DHM Design
900 S Broadway
Denver, CO 80209

Attn: Mr. Bill Neuman

Re: **Geotechnical Investigation**
Monaco Park Renovation
NE Corner of E 56th Avenue and Monaco Street
Commerce City, CO

Project No: D23G115

Mr. Neuman:

Pursuant to your request, Triax Engineering, LLC ("Triax") has completed the Geotechnical Investigation for the Monaco Park Renovation, located at NE Corner of E 56th Avenue and Monaco Street in Commerce City, CO. The attached report presents the results of the field investigation and laboratory testing and recommendations for foundation type and bearing pressures and other recommendations related to the proposed construction.

We appreciate and wish to thank you for the opportunity to be of service to you on this project. If we can be of additional assistance, please contact us at (720) 230-1931.

Very Truly Yours,
Triax Engineering, LLC

Vinod Ravindran, PE
President

Distribution: Via Email

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Attachments:

- Boring Location Plan
- Boring Logs
- Laboratory Test Results
- Key to Classification Terms

EXECUTIVE SUMMARY

The soil conditions at the site of the proposed park renovation located NE Corner of E 56th Avenue and Monaco Street in Commerce city, CO, was explored by drilling four borings to depths of 7 to 20-ft each. Laboratory tests were performed on selected specimens to evaluate the engineering characteristics of the soil strata encountered in our borings.

This report presents a description of subsurface conditions encountered at the site, recommended foundation systems, and design and construction criteria influenced by the subsurface conditions. It is based on data obtained from field investigations, laboratory test results and our previous experience. A summary of our findings and recommendations is presented below:

This executive summary must be used in conjunction with the entire report. Please note that this section provides a broad overview and will not include specific details for each item. Therefore, the report must be read in its entirety to achieve a comprehensive understanding of the items contained herein.

- The subsurface conditions may generally be grouped into One to two generalized strata with similar physical and engineering properties within each stratum. For detailed descriptions, the boring log is provided at the end of this report.
- Groundwater seepage was not encountered in our borings during or after drilling. However, it should be understood that groundwater levels will fluctuate with seasonal climatic variations and changes in the land use.
- Based on our design engineering analysis, we recommend utilizing shallow spread footings to support the proposed shelters at the subject property.
- The proposed shelters at the subject property can be supported by Shallow spread-type footings founded on undisturbed in-situ soils. Shallow spread-type footings founded on undisturbed in-situ soils, bearing at minimum depth of 3-feet below the lowest finished grade, for frost protection shall be designed for a maximum allowable soil bearing pressure of 1,750 pounds per square foot (PSF).

Table EX-1 Recommended Foundation Systems

Proposed Structure	Type of Foundation	Allowable Bearing Capacity (psf)	Bearing Depth from Final Grade (ft)
Shelters	Shallow Spread Footings founded on undisturbed in-situ soils or on compacted structural fill (as needed)	1,750	3-ft for frost protection

- There is a *moderate* risk of slab movement at the proposed slab elevations when the slab is supported by the near-surface soils, under current moisture conditions. Potential vertical movements on the order of two to four inches (unmitigated) can be anticipated at this project site due to seasonal moisture variation of subgrade soils. If some movement of a slab is not acceptable, the proposed structure should be constructed utilizing a structural floor system, rather than a slab.
- In order to minimize the chance for moisture infiltration into the foundation soils and limit the potential for movement of the foundations and/or slabs, positive drainage down and away from all foundation walls and the structure should be established and maintained at all times.
- Due to the presence of hydro-collapsible soils at project site, an exterior foundation perimeter drain is recommended below foundation elevations.
- Detailed descriptions of subsurface conditions, engineering analysis, and design recommendations are included in this report.

1. **Introduction:**

This report presents the results of our Geotechnical Investigation for the proposed Monaco Park Renovation, located NE Corner of E 56th Avenue and Monaco Street in Commerce City, CO. The object of this investigation was to evaluate the physical properties of the soils underlying the site and provide foundation and earthwork recommendations based on our findings.

2.0 **Proposed Construction:**

It is our understanding that the proposed project will include the construction of two picnic shelters, site walls up to 5-ft, parking lot and sidewalks.

Table 1 Proposed Construction Information

Location	Proposed Construction
NE Corner of E 56th Avenue and Monaco Street	Picnic Shelter Sidewalks Parking Site Walls

The proposed construction will consist of a concrete floor system with masonry walls and steel / wood frame construction above grade. Although foundation loads are unknown at the time of this report, it is anticipated that the structures will be loaded with column and wall loads on the order of 8 kips and 1 kip per linear foot, respectively. Should designs details differ from those presented, this firm should be notified so we can provide additional recommendations, if required.

3.0 **Purpose and Scope of Services:**

The purpose of our geotechnical investigation was to provide subsurface information and geotechnical engineering recommendations for the proposed construction.

Our scope of services includes the following:

- 1) Drilling and sampling of four borings to depths of 7 to 20-ft each.

- 2) Evaluation of the in-place conditions of the subsurface soils.
- 3) Observation of the groundwater conditions during field exploration operations;
- 4) Provide recommendations for
 - Shallow foundations
 - Floor slab design
 - Pavement thickness design
 - Earthwork and drainage

The Scope of Services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client.

4.0 Site Conditions:

The project is located Ne Corner Of E 56th Avenue And Monaco Street in Commerce City, CO. Topographically, the subject site was sloping down towards the south. The average elevation varied between 5200 feet and 5210 feet, with the lowest elevation along south east corner of property and the highest elevation along the south end of the property. The project site had vegetation cover at the time of our exploration.

5.0 Geotechnical Investigation:

Subsurface conditions were investigated by drilling four borings to the depth of 7 to 20-ft from the existing grade at the locations indicated on the Site Map. The borings were advanced using a 4-inch diameter continuous flight auger powered by a CME-55 drilling rig. Samples were taken at selected intervals using a standard split spoon and a California ring sampler, which was driven into the soil by dropping a 140-pound hammer through a free fall of 30 inches – Standard Penetration Test (SPT). The number of blows (N) required to drive the sampler

into the soil is known as a blow count. The number of blows required for the sampler to penetrate 12 inches is evaluated and gives an indication of the consistency or relative density of the soils and bedrock encountered. The results of the penetration test and log of materials encountered are presented in the Logs of Exploratory Boring.

Table 2 Summary of Field Exploration

Boring No.	Depth (ft)
B-1	7
B-2	20
B-3	20
B-4	20

6.0 Laboratory Testing Program

Samples were returned to the laboratory where they were visually classified, and testing was assigned to evaluate the engineering properties of the soil layers. A project specific laboratory testing program was designed to identify the engineering properties of the subsurface materials. Our laboratory testing program included the following tests on selected samples.

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Water Content | <input checked="" type="checkbox"/> Atterberg Limits | <input checked="" type="checkbox"/> -200 Wash |
| <input checked="" type="checkbox"/> Particle Size Analysis | <input checked="" type="checkbox"/> Swell / Consolidation | <input checked="" type="checkbox"/> Dry Density |
| <input checked="" type="checkbox"/> Unconfined Compressive strength Tests | <input checked="" type="checkbox"/> Water Soluble Sulfates | <input checked="" type="checkbox"/> Soil Resistivity |
| <input checked="" type="checkbox"/> California Bearing Ratio | <input checked="" type="checkbox"/> Moisture Density Relationship | <input checked="" type="checkbox"/> Soil pH |

7.0 General Subsurface Conditions:

The subsurface conditions may generally be grouped into One to two generalized strata – brown clayey sand and brown sandy lean clay underlain by weathered claystone bedrock – with similar physical and engineering properties as per the boring logs provided at the end of this report.

Table 3 Subsurface Stratigraphy

Boring No.	Material Description	Approximate Depth (ft)	Consistency
B-1	Dark Brown Clayey Sand	0-2	Moist, Loose, Fill
	Brown Silty Sand	2-7	Moist, Loose
B-2	Brown Silty Sand	0-20	Moist, Loose to Medium Dense
B-3	Brown Silty Sand	0-20	Moist, Loose to Medium Dense
B-4	Dark Brown Sandy Clay to Clayey Sand	0-5	Moist, Stiff to Very Stiff
	Brown Silty Sand - With fat clay seams and layers at 10-ft	5-20	Moist, Loose to Medium Dense

7.1 Collapsible Soils

Collapsible soils are hydro-compactive, meta-stable, low density and water sensitive soils. As water percolates in to a collapsible soil, the structure formed by individual grains of soil breaks down and causes the ground surface to subside. The collapse, which is known as hydro-consolidation can be caused by water percolating from newly created water features, irrigation, change in groundwater table and storm run-off from roadways and roofs of buildings. Most collapsible soils are dry fine grained soils with a honeycomb skeletal fabric of open pores.

Typically alluvial soils are not considered collapsible. However, geotechnical evaluations of individual building sites and other structures, should include an assessment of the possible presence of collapsible materials in the foundation soils.

Collapsible soils were encountered between the depths of 5-ft and 10-ft in the vicinity of borings B-2 and B-3. This report does not discuss the remediation techniques for collapsible soils, as there were no proposed

structures identified at these locations. However, if treatment options for collapsible soils are desired, please reach out our office.

8.0 Groundwater Conditions:

Groundwater seepage was encountered in our borings 48-hours after field exploration. However, groundwater levels will fluctuate with seasonal climatic variations and changes in land use. It is not unusual to encounter shallow ground water during snow melt or during or after periods of precipitation. The surface water tends to percolate down until it encounters a relatively impervious layer.

Table 4 Groundwater Conditions

Boring No.	Date of Measurement	Depth from Existing grade (ft)
B-1	03/09/2023	NA
	03/13/2023	NA
B-2	03/09/2023	NA
	03/13/2023	NA
B-3	03/09/2023	NA
	03/13/2023	NA
B-4	03/09/2023	NA
	03/13/2023	NA

Accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variation, temperature, recent precipitation, and localized construction activities that influence drainage characteristics may influence the groundwater table and volumes of water will depend on the permeability of soils. Groundwater conditions can differ between borehole locations and in areas not explored.

9.0 Design Engineering Analysis:

The recommendations presented below are based on the data obtained from our field and laboratory tests, our past experience with geotechnical conditions similar to those at this site, and our engineering design analysis.

Based on the soils encountered at the project site, we recommend that deep foundations be utilized to support the proposed Monaco Park Renovation.

9.1 Shallow Spread Footings:

The proposed shelters at the project site can be supported by shallow spread footings. Variable soil conditions encountered in the project site shall be mitigated as outlined in this section. The owner should understand and accept the risk that even after the mitigation, there will be foundation movement due to natural wetting and drying cycles of the foundation subgrade. Excessive wetting and drying will result in proportional movement of the foundation, sometimes in excess of the estimated movement provided in this report.

Shallow spread-type footings founded on undisturbed in-situ soils, bearing at minimum depth of 3-feet below the lowest finished grade (for frost protection), in conjunction with the recommended site preparation and moisture protection provisions, can be used to support proposed structures at the project site. A maximum allowable soil bearing pressure of 1,750 pounds per square foot (psf) is recommended for the design of shallow spread-type footings bearing on undisturbed in-situ soils.

For shallow spread footings founded between the depth of 1-ft and 3-ft below existing grades and bearing undisturbed in-situ soils, a maximum allowable bearing pressure of 1,750 pounds per square foot (psf) is recommended.

Footings shall have a maximum width of 4-ft. Allowable bearing capacities shall be reduced by 500 psf for footings that have more than 4-ft width. Interior footings located in areas not susceptible to frost penetration

shall bear on materials prepared in accordance with the same criteria specified for full depth footings. Interior footings, bearing on 4-ft of recompacted and moisture conditioned suitable onsite soils or compacted structural fill, founded at minimum depth of 1-ft below finish grade shall be designed with the same criteria provided in this section.

Stiffened grid beam and slab foundations, if desired can be designed using the same recommendations as provided in this section. We recommend a minimum beam width of 12 inches. Beams shall intersect at relatively heavy load areas such as underneath columns.

Table 5 Allowable Bearing Capacities

Type of Foundation	Allowable Bearing Capacity (psf)	Bearing Depth from Final Grade (ft)	Over-excavation Depth (ft)		Max Footing width (ft) / Reduction in Bearing Capacity (psf)	Minimum Deadload (psf)
			Below Foundation elevation (ft)	Total from existing grade		
Shallow Spread Footings founded on undisturbed in-situ soils or on compacted structural fill (as needed)	1,750	1-3	--	--	4/500	800

In order to minimize the sensitivity of the structure to differential movement, the footings and walls should be reinforced to allow for a degree of load re-distribution should a localized zone of the supporting soils become saturated. Stem walls should either be positively separated from the floor slabs or reinforced to prevent cracking at the slab stem wall interface.

Significant moisture increase in the in-situ soils could create additional and/or excessive movements in some areas of the site. Accordingly, the site drainage and moisture protection provisions, recommended in this report are critical design considerations.

Prior to placing concrete, all bearing surfaces must be cleared of all loose material. Disturbed material may only be re-compacted with guidance from, and after contacting this office.

To verify the soil conditions and soil bearing capacity, it is required that an open hole observation be performed. The entire excavation must be dug down to final grade prior to the observation. If potentially expansive clay, deleterious material, or other unsuitable conditions are found, additional over-excavation of some or the entire site may be required – replacing inadequate soils with acceptable materials. Revised foundation recommendations – such as the use of mat foundation – may also be required. **Please call to schedule this inspection.**

Ensure that the requirements contained herein are reflected in any construction plans developed for this site. In order to minimize the chances of water damage to the structure(s), an exterior perimeter drain is recommended for structures built on this site. This drain may flow into a sump pit fitted with a pump or may flow to a suitable ‘daylight’ outside of the structure.

Alternatively, for structures without basement, exterior perimeter drain can be eliminated if a minimum of 5-ft of non-pervious flatwork surrounds the structure. Irrigation lines and sprinkler heads shall undergo periodic maintenance and inspection to detect and repair any leaks that may cause moisture infiltration and subsequent saturation of foundation subgrade.

The risk for wetting of foundation soils can be reduced by carefully planned and maintained surface drainage. The following precautions should be observed during construction and be maintained at all times after the structure is completed. Excessive wetting or drying of open foundation excavations should be avoided as much as possible during construction. Backfill adjacent to walls should be moisture conditioned. Any settlement of backfill after completion of the structure should be repaired and positive drainage re-established.

9.2 Post Construction Movement:

Based on experience, we estimate total movement in the order of one inch for footings designed and constructed as discussed in this report. Differential movement across individual buildings are estimated to be approximately $\frac{1}{2}$ to $\frac{3}{4}$ times of the total settlement. To reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle at different rates.

Table 6 Post Construction Movement

Description	Movement
Total Movement	1 inch
Differential Movement	$\frac{1}{2}$ inch to $\frac{3}{4}$ inch

However, please note that higher magnitude of vertical movement on the order of several inches may occur if the excessive wetting or excessive drying of the subgrade soils occur due to final drainage conditions and / or lack of periodic maintenance.

10.0 Seismic Considerations:

Based on the chapter 20 of ASCE 7 / International Building Code (2012 IBC Table No. 1613.3.3(2)), a site classification of "D" shall be used for the structures in the proposed structure. The site classification is based on the available geological data to an average depth of 100-ft and our previous experience with soil conditions in the general project area.

11.0 Slab Construction:

The risk of slab performance at this site is judged to be *moderate* under current moisture conditions. However, it must be understood, that changes in the water content of these soils may cause the soil to swell or shrink, which may cause movement or cracking of slabs.

Table 7 Slab Performance Risk

Building	Slab on Grade Performance Risk
Monaco Park Renovation	Moderate

Potential vertical movements, on the order of two to four inches shall be anticipated at this project site due to seasonal moisture variations. However, if some movement of a slab is not acceptable, the proposed structure should be constructed utilizing a structural floor system, such as void forms, rather than a slab.

During the construction phase, contractor shall take care to not let the exposed subgrade soils dry out during construction. Excessive drying of the subgrade soils during construction and subsequent wetting may result in higher than expected movement.

To reduce the risk of potential movement, we recommend removal of shallow underlying silty and sandy clays, immediately below the slabs on grade to a minimum depth of 2-ft and replacing with compacted moisture conditioned onsite soils.

The risk of slab movement can be minimized by moisture conditioning onsite soils to a minimum depth of 4-ft below the slab elevation (FFE). Suitable onsite soils shall be compacted to a minimum of 95% of maximum dry density as obtained by ASTM D698, within -2 to +2 percentage points of optimum moisture content. Removal and replacement of shallow underlying clays as outlined above shall significantly reduce the risk of movement of the slabs on grade to the order of one inch.

Should the owner elect to accept the risks of expansive/consolidating soils and the effects they may have on slabs, the following measures have been shown to be helpful when constructing slabs.

The slabs must not bear on thick lifts of gravel or other materials which may allow the migration of water below the slabs. **However, up to 4 inches of gravel can be used as a levelling course and as a capillary barrier. If the on-site soils are not acceptable, it is preferable to bear slabs on non-expansive imported materials. This will**

minimize the transfer and retention of water below the slab. Materials with a Liquid Limit below 30 and a Plasticity Index between 10 and 15 are preferred.

Slabs shall be isolated from foundation components by slip joints constructed to allow the independent movement of the slab. Slabs shall also be separated from any utility components by isolation joints. Mechanical equipment resting on slabs must be fitted with expandable/collapsible sections in order to allow movement of the slab without damage to the equipment or to the structure.

Non-bearing partition walls must be constructed with a minimum of 1-inch of float to allow for movement of the slab without damaging any part of the structure. All doors shall be constructed with at least a 1-inch gap at floor level. It is the owner's responsibility to monitor and maintain all floats and gaps as necessary. If additional information on float is needed, please contact this office. A properly engineered and constructed vapor barrier should be provided beneath slabs-on-grade that will be carpeted or receive moisture sensitive coverings or adhesives.

Slabs must be appropriately reinforced to resist the anticipated loads as well as the effects of the supporting soils. Floor slabs must also be scored in accordance with the American Concrete Institute (ACI) recommendations in order to control cracking of the slab due to shrinkage or other factors. These scores should be a maximum of 12 feet apart.

12.0 Water Soluble Sulfates:

Laboratory test results indicate 0.08% by dry weight of water-soluble sulfates, for selected samples. Severity of potential exposure to water soluble sulfates is classified as negligible for this site. However, we use of sulfate resistant cement shall be anticipated for below grade structures.

Table 8 Water Soluble Sulfates

Boring No.	Depth (ft)	Concentration of Water-Soluble Sulfates (% dry wt.)	Severity of potential exposure ¹
B-3	1	0.08	Class 0

Severity of exposure potential classified as per 2015 CDOT pavement design manual.

13.0 Soil Corrosivity:

pH tests were conducted on selected samples. Test results indicate that the soils at the subject site can be classified as mildly corrosive. We recommend engaging a qualified corrosion engineer to review the test results presented here and determine the need for appropriate level of corrosion protection for buried metals.

Table 9 Soil Corrosivity

Boring	Depth (ft)	pH		Resistivity (Ω -cm) (Moist)
		(Distilled Water)	(Calcium Chloride 0.01N)	
B-3	1	7.4	7.2	1,093

14.0 Pavement Design Recommendations:

It is our understanding that there will be light-duty, pavement/parking associated with the proposed construction. The following designs have been based on American Association of State Highway and Transportation Officials (AASHTO) Guideline for Design of Pavement Structures. Areas within the proposed pavement on the site have been divided into two categories based upon anticipated usage. We assume that the final pavement grades will provide adequate drainage for the pavement areas and that water will not be allowed to enter the pavement system by either edge penetration adjacent to landscape areas or penetration from the surface due to surface ponding, or inadequate maintenance of pavement joints, or surface cracks that may develop.

14.1 Subgrade Soils:

Results of our laboratory testing indicate that the subgrade materials classify predominantly as clayey sands/ sandy clays. According to AASHTO General subgrade rating, onsite soils are rated as fair. We estimated

a design R-value of 14 for the pavement design, a resilient modulus (M_R) of 4,060 psi and a modulus of subgrade reaction (k-value) of 125 pci by correlation.

14.2 Traffic Estimates:

Traffic estimates were not available during the preparation of this report. For the purpose of this report, it has been assumed that the two designs will be for general automotive parking areas and drive areas.

Table 10 Traffic Estimates

Areas	20 year ESAL
Parking Areas (Light Duty)	14,500
Drive Areas (Medium Duty)	25,000
Drive Areas / Drive Thru (Heavy Duty)	45,000

14.3 Design:

For design purposes, local drainage characteristics of proposed pavements areas are considered fair to poor. These characteristics, coupled with the approximate duration of saturated subgrade conditions, results in a design drainage coefficient of 0.90 when applying the AASHTO criteria for design. For the flexible pavement design, a terminal serviceability index of 2.00 was utilized along with an initial serviceability of 4.2. An inherent reliability of 80% and design life of 20 years was assumed.

The recommendations provided shall be compared to the local agency pavement design standards and in the event of any conflict; the more stringent specification shall be adopted.

In addition to the flexible pavement design analysis, a rigid pavement design analysis was completed, based upon AASHTO design procedures. Rigid pavement design is based on an evaluation of the Modulus of

Subgrade Reaction of the soils (K-value), the Modulus of Rupture if the concrete, and other factors previously outlined. A modulus of rupture of 600 psi was used for the pavement concrete.

Table 11 Pavement Design Alternatives

Traffic Area	Moisture Conditioned Subgrade Thickness	Alternative	Recommended Pavement Section Thickness (inches)			
			Aggregate Base Course	Plant Mixed Bituminous Pavement	Portland Cement Concrete Pavement	Total
Automotive Parking (Light Duty)	12 Inches	A	-	5.0 in.	-	5.0 in.
	12 Inches	B	4.0 in.	4.0 in.		8.0 in.
	12 Inches	C			5.0 in.	5.0 in.
Drives (Medium Duty)	12 Inches	D		5.5 in.	-	5.5 in.
	12 Inches	E	5.0 in.	4.0 in.	-	9.0 in.
	12 Inches	F			5.0 in.	5.0 in.
Drives (Heavy Duty)	12 Inches	G	-	6.5 in.	-	6.5 in.
	12 Inches	H	7.0 in.	4.0 in.		11.0 in.
	12 Inches	I			6.0 in.	6.0 in.
Sidewalks	12-inches				4.0 in.	4.0 in.
Fire Lanes/Trash Dump Areas/Loading Docks	12 Inches			7.0 in.		7.0 in.
	12 Inches				7.0 in.	7.0 in.

14.4 Subgrade Preparation:

For the pavement to perform adequately, final grades shall provide adequate drainage and that water will not be allowed to enter the pavement system by either edge penetration adjacent to landscape areas or penetration from the surface due to surface ponding, or inadequate maintenance of pavement joints, or surface cracks that

may develop. If water is allowed to enter the pavement subgrade, swelling of the moisture conditioned subgrade soils may occur.

Each alternative should be investigated with respect to current material availability and economic conditions. Rigid concrete pavement, a minimum thickness of 7 inches is recommended for fire lanes, locations of loading docks and dumpsters where trash trucks park and load.

The subgrade shall be proof rolled using a rubber tired equipment with a gross vehicle weight not less than 30,000 lbs.; such as a fully loaded water truck. A minimum of three passes should be made. The proof rolling should be observed by Triax Engineering. If proof roll cannot be achieved, the subgrade shall need to be stabilized.

Aggregate base course (if used on the site) should consist of a blend of sand and gravel that meets specifications for quality and gradation. The use of materials meeting Colorado Department of Transportation (CDOT) Class 6 base course specifications is recommended. All asphalt pavements shall conform to specifications in CDOT section 401 Standard Specifications for Road and Bridge Construction.

The pavements constructed on the subgrades such as the one encountered at this site may be subjected to swell / consolidation related movements. Hence, periodic maintenance such as crack sealing and surface finishing are anticipated. Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. The location and extent of the joints should be based upon the final pavement geometry and should be placed (in feet) at roughly twice the slab thickness (in inches) on center in either direction. Sawed joints should be cut within 24-hours of concrete placement and should be a minimum of 25% of the slab thickness plus ¼ inch. All joints should be sealed to prevent entry of foreign material and dowelled where necessary to provide load transfer.

It is important that any existing organic and compressible soils (the upper soils which contain organic materials such as leaves, roots, etc.) be removed and the exposed subgrade be properly prepared prior to pavement installation. The subgrade should be scarified to the required depth and then compacted to 95 percent of the maximum dry density as obtained by ASTM D698 and moisture content between -2 to +2 percentage points of optimum moisture content. Base course material should be placed immediately upon completion of the subgrade compaction operation to prevent drying of the soils due to exposure.

15.0 Lateral Loads:

The ultimate passive soil resistance against edges of footings, grade beams, etc., with properly compacted (non-expansive) backfill, should be considered as being equal to forces exerted by a fluid of 55 pounds per cubic foot (PCF) unit weight.

Below grade walls must be designed for lateral loads. For "active" conditions, the walls should be designed for an equivalent fluid pressure of 45 PCF for compacted clayey sands. For "at rest" conditions, equivalent fluid pressures of 60 PCF should be used. For "passive" conditions, equivalent fluid pressures of 255 PCF (without factor of safety) should be used. These loads do not include swelling pressures, hydrostatic loads, or surcharge loads, such as sloping backfill or vehicles.

Table 12 Equivalent Fluid Pressures

<u>Equivalent Fluid Pressure</u>	<u>Clayey / Silty Sand (On-site Soils)</u>	<u>CDOT Class 1 Structural backfill (Properly Compacted)</u>
Active	45 pcf	45 pcf
Passive (Without factor of safety)	255 pcf	255 pcf
At rest	60 pcf	60 pcf

The above values are for properly compacted backfill. These values are not valid for submerged conditions.

16.0 Site Retaining Walls:

Shallow spread-type footings founded on undisturbed in-situ soils, bearing at minimum depth of 3-feet below the lowest finished grade (for frost protection), in conjunction with the recommended site preparation and moisture protection provisions, can be used to support the site retaining walls.

Table 13 Shallow Bearing Capacities for Site Walls

Elevation (ft)	Allowable Bearing Capacity (psf)
3-ft below grade	1,750 psf

Allowable soil bearing pressure as provided above is recommended for the design of shallow spread-type footings bearing on *undisturbed in-situ soils* and founded at a minimum depth of 3-feet below the lowest finished grade at the site (or that required by local jurisdiction; whichever is greater) for frost protection.

For structural design purposes the following parameters can be used for the site retaining walls. It is anticipated that the retaining walls will be constructed within the sandy lean clay encountered in our borings.

Table 14 Structural Design Parameters

Angle of Repose	1.5H:1V Clayey Sand (SC)
Coefficient of Friction for sliding	0.35 between SC and Concrete
Angle of Internal Friction	27°
Cohesion	--
Total Unit Weight	105 pcf

Engineered design shall be used for retaining walls with a height of 4-ft or more, or if there are any structures planned within 10-ft of the wall.

For structural backfill and behind the retaining wall, properly compacted CDOT class 1 structural backfill shall be utilized. In order to minimize the sensitivity of the structure to differential movement, the footings and

walls should be reinforced to allow for a degree of load re-distribution should a localized zone of the supporting soils become saturated.

Significant moisture increase in the in-situ soils could create additional and/or excessive movements in some areas of the site. Accordingly, the site drainage and moisture protection provisions, recommended in this report are critical design considerations.

Prior to placing concrete, all bearing surfaces must be cleared of all loose material. Disturbed material may only be re-compacted with guidance from, and after contacting this office.

To verify the soil conditions and soil bearing capacity, ***it is required that an open hole observation be performed.*** The entire excavation must be dug down to final grade prior to the observation. If potentially expansive clay, deleterious material, or other unsuitable conditions are found, additional over-excavation of some or the entire site may be required – replacing inadequate soils with acceptable materials. Revised foundation recommendations – such as the use of drilled piers – may also be required. **Please call to schedule this inspection.**

We recommend a foundation drain for the retaining walls built on this project site. Retaining walls shall have minimum 12-inch thick drainage layer or engineered drainage board between the wall and the backfill to dissipate pore water pressure.

17.0 Onsite Soils:

Onsite soils generally found up to a depth of 7-ft below existing grade can be used for structural fill and for general fill purposes such as landscaping, or trench backfill. The owner should understand and accept the potential risk of increased movement if on-site soils are used as structural fill. Onsite soils free of debris, organic materials, and other deleterious materials can be used as general fill, such as utility trench backfill, or landscape backfill.

However, due to the varying soil conditions, there is a potential for the presence of debris and other deleterious materials within the excavation depth. If deleterious soils, soft spots, construction debris, trash, landfill, or other contaminants are encountered during excavation, part or whole of the excavated soils shall not be used for structural fill purposed and additional quantities of removal and replacement of onsite soils, greater than anticipated may be required. Suitability of existing soils for use as fill material as outlined above shall be verified by the geotechnical engineer during construction phase. If the risk of movement cannot be accepted, select structural fill shall be utilized underneath the foundations.

Table 15 Use of onsite soils

Soil type	Acceptable location for placement
Clayey Sand (SC)	- Onsite soils can be used for landscape, trench backfill, embankments, and other general use.
Silty Sands (SM)	- Onsite soils can be used as structural fill underneath foundations and building pad.

18.0 Utility Consideration:

Utilities that project through slab on grade shall be designed with some degree of flexibility or with sleeves, which will help reduce the risk of damage to utility facilities due to soil movement such as shrinkage and swelling.

19.0 Trench Excavation and Backfill:

Excavations at this project site shall be performed in accordance with all governing safety regulations. Based on OSHA soil classification, majority of soils encountered at the project site are classified as Type C. Open excavations in Type C soils shall have a maximum slope of 1.5H:1V, up to a maximum depth of 20-ft. If the required temporary excavation slopes could not be achieved, engineered shoring or other bracing systems shall

be considered. Qualified personnel should continuously review the stability of excavation slopes. The responsibility for excavation safety and temporary construction slopes lies solely with the contractor.

20.0 Drainage:

An exterior foundation perimeter drain is recommended in order to protect the structure from water damage. Foundation wall must be braced or be supported by first floor framing prior to backfilling the foundation. The risk for wetting of foundation soils can be reduced by carefully planned and maintained surface drainage. The following precautions should be observed during construction and be maintained at all times after the structure is completed.

Excessive wetting or drying of open foundation excavations should be avoided as much as possible during construction. Backfill adjacent to foundation walls should be moistened and compacted. Any settlement of backfill after completion of the structure should be repaired and positive drainage reestablished.

The ground surface surrounding the structures should be sloped to drain away from the structures in all directions. A minimum slope of 12 inches in the first 10 feet should be achieved and maintained after construction. Roof downspouts and drains for the structures should discharge to the surface well beyond the limits of all backfill. Irrigated landscaping should not be placed within 5 to 10 feet of the foundation walls.

Plastic membranes should not be used to cover the ground surface immediately surrounding the structures. These membranes trap moisture and prevent normal evaporation from occurring. Geotextile fabrics are a suitable option to control weed growth and allow some evaporation.

In order to minimize the chances of water damage to the structures, an exterior perimeter drain is recommended for any structures built on this site. This drain may flow into a sump pit fitted with a pump or may flow to a suitable 'daylight' outside of these structures.

However, for structures without basement, exterior perimeter drain can be eliminated if a minimum of 5-ft of non-pervious flatwork surrounds the structures on all sides. Irrigation lines and sprinkler heads shall undergo periodic maintenance and inspection to detect and repair any leaks that may cause moisture infiltration and subsequent saturation of foundation subgrade.

21.0 Site Preparation:

Organic material, manmade fill, and any debris or deleterious materials should be removed from the foundation area and wasted off site or used for non-structural purposes. Structural fill material (or processed on-site soils) must be placed in 8 inches loose layers and compacted to 6-inch lifts and compacted to 95 percent of the Standard Proctor maximum dry density within 2 percent of the optimum moisture content.

Structures supported by insufficiently compacted structural fill may settle. Any fill utilized for non-structural purposes – such as landscape backfill – must be compacted to a minimum of 90 percent of maximum dry density as determined by ASTM D 698. In hot, windy, or dry weather, the site should be periodically wetted with a water spray if needed to maintain its moisture content and not dry out excessively.

22.0 Structural Fill and Compaction Requirements:

Any select structural fill used at the site should have a Liquid Limit less than 35 and a Plasticity Index between 5 and 10. The fill should contain no particles greater than 3 inches in diameter. The percent passing U.S. Standard Sieve No. 4 should be between 40 and 80 percent and passing Sieve No. 40 between 10 and 50 percent. The percent passing Sieve No. 200 should be less than 50 percent. The fill materials shall be placed in loose lifts not to exceed 8 inches and compacted to as outlined in the following table.

If the existing grade must be raised to attain the finish grade elevation, select fill should be placed, compacted, and tested for compaction compliance by Triax Engineering, LLC.

Table 16 Compaction Specifications

Soil Type		Dry Density	Moisture Content
Structural fill (import)		Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture
Slab on Grade (import)		Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture
Embankments / Class 6 ABC		Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture
Onsite soils – General Fill and Structural fill (Over-excavated and moisture conditioned)	CL	Min. 95% (ASTM D 698)	0 to +3% of Optimum Moisture
	SC/SM	Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture
Flatwork / Roadways (onsite soils)	CL	Min. 95% (ASTM D 698)	0 to +3% of Optimum Moisture
	SC/SM	Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture

23.0 Excavations and Shoring:

Excavations should not remain open for extended periods of time, permitting wetting or drying of the bearing materials. Moisture change in the bearing materials may increase the risk for movement. Care should be taken when working near the sides of excavations at all times, and the slopes should be monitored by onsite personnel during construction for evidence of sloughing, bulging, or toppling of the sidewalls or cracking at the ground surface.

Due to the types of soil present, shoring or stabilization of the excavation may be necessary at this site. An open-hole observation should be performed if required by the local municipality or if there are any concerns regarding excavation safety or stability. If the proposed excavation is within 10-ft of any existing structure, or if potential property damage or safety is an issue, some form of shoring may be required.

24.0 Excavations and Slopes:

Based on the soil type encountered at the project site, temporary excavations at the project site shall have a minimum temporary and permanent slope of 1.5H:1V and 4H:1V, respectively, as outlined in Table 17. Project scope did not include a detailed slope stability analysis.

Table 17 Temporary Excavation slopes

Soil Type	Temporary Slopes	Long Term Slopes
Clayey Sand / Silty Sand	1.5H:1V	4H:1V or greater (less steep)

A detailed slope stability analysis shall be conducted if the slopes will exceed a height of 5-ft and / or the slope will experience any surcharge, such as from traffic or other structures.

Surcharge loading at the top of the cut by equipment, materials, or vehicles must be avoided since surcharge loading will increase the risk of caving. Spoils of the excavation must be placed a minimum of 5 horizontal feet from the edge of the excavation. Final evaluation of excavations, excavation slopes and soil and bedrock materials exposed in excavations should be done during construction by the contractors “competent person” as required by OSHA guidelines.

25.0 Limitations:

In any subsurface investigation, limited data is available from which to formulate soil descriptions and generate recommendations for foundations and related construction components. The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations. The report does not reflect variations that may occur between borings across the site. The samples taken are indicative of the subsurface materials at the time and at the location the samples were taken. Precipitation, seasonal changes, and excavating are just a few of the factors, which may create changes in the composition of the site. If variations then appear evident, it will be necessary to re-evaluate our recommendations after performing on-site observations and tests to establish the engineering significance of any variations.

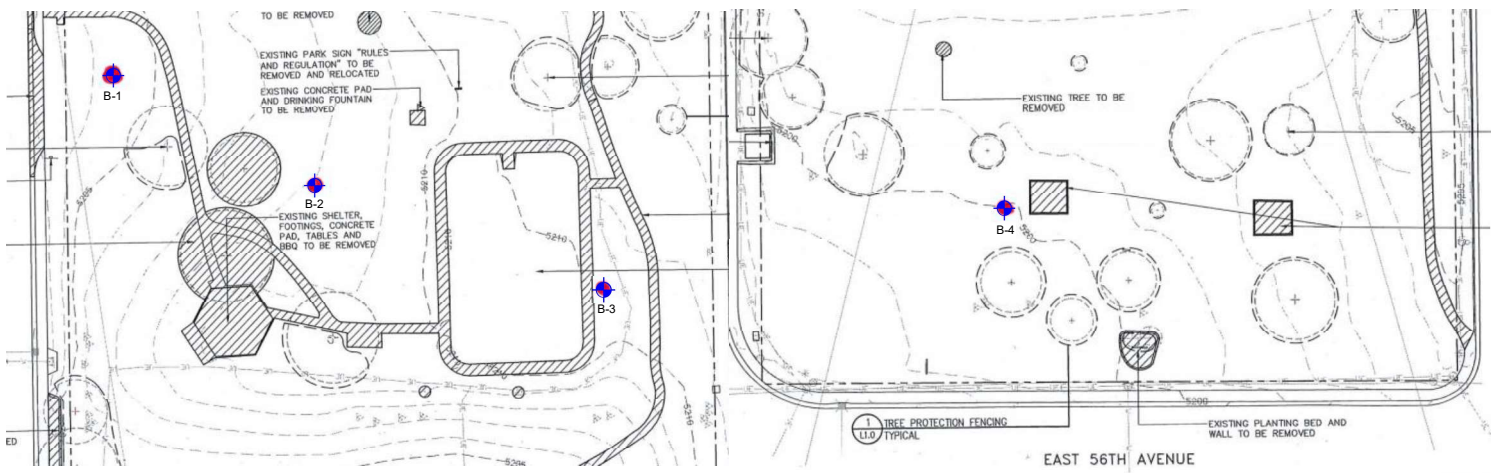
This report does not address nor was intended to address any environmental issues, hazardous materials or toxic waste issues, or other subsurface situations or conditions other than those described within this report. The project geotechnical engineer declares that the findings, recommendations and/or professional advice

contained herein have been made and this report prepared in accordance with generally accepted professional engineering practice in the fields of geotechnical engineering and engineering geology. No other warranties are implied or expressed.

This report is valid until site conditions change due to disturbance (cut and fill grading) or changes to nearby drainage conditions, or for 3 years from the date of this report, whichever occurs first. Beyond this validation date, Triax shall not accept any liability associated with the engineering recommendations in the report, particularly if the site conditions have changed. If this report is desired for use for design purposes beyond this validation date, we highly recommend drilling additional borings so that we can verify the subsurface conditions and validate the recommendations in this report."

This report is intended for the sole use of DHM Design and approved agents during the construction of the above mentioned project site. This office cannot be responsible for any conclusions or recommendations made by other parties based upon the data contained herein.

Boring #	Depth (ft)
B-1	7
B-2	20
B-3	20
B-4	20



Monaco Park Renovation
Commerce City, CO

Boring Location Plan

Project No: D23G115

Not to Scale



Log of Boring: B-1

ELEVATION AND DATUM:

Lat: _____ Long: _____ Elev:ft. _____

DATE STARTED: 03/09/2023

DATE FINISHED: 03/09/2023

TOTAL DEPTH (ft.): 7

GROUND WATER (ft):
During Drilling: N/A After 48 Hrs: _____

Project Name: Monaco Park Renovation

ADDRESS: NE Corner of E 56th Ave. & Monaco St.
Commerce City CO 80022

Location: Proposed Parking Lot

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

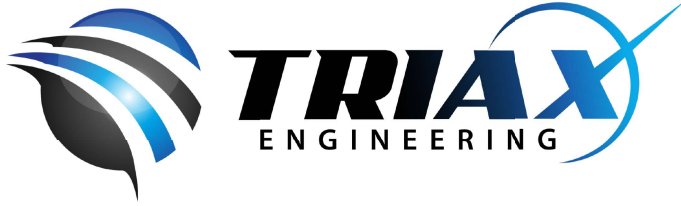
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS										
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)	
													0	20	40
0				Top Soil / Vegetation	9.7										
		SS	7	Dark Brown Clayey Sand (fill)											
		CA	7	Brown Silty Sand — Loose	6.8	23.0	-2.5	26	9	109.8	SC	240			
5		SS	4		6.5										
		CA	5		4.8							97			
10				— End of Borehole —											
15															
20															
25															
30															
35															
40															
45															

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D23G115

Triax Engineering, LLC 5371 Magnolia Street, Commerce City, CO 80022
PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 1



Log of Boring: B-2

ELEVATION AND DATUM:

Lat: _____ Long: _____ Elev: ft. _____

DATE STARTED: 03/09/2023

DATE FINISHED: 03/09/2023

TOTAL DEPTH (ft.): 20

GROUND WATER (ft):
During Drilling: N/A After 48 Hrs: _____

Project Name: Monaco Park Renovation

ADDRESS: NE Corner of E 56th Ave. & Monaco St.
Commerce City CO 80022

Location: Proposed Shelter

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
													0	20	40	
0				Top Soil / Vegetation	12.8								0.08			
		SS	5	Brown Silty Sand — Moist, Loose to Medium Dense	3.7	9.8	-2.1	23	5	107.4	SW-SM	97				
		CA	6		4.8											
5		SS	7		3.6		-1.3			112.9		95				
		CA	11		5.9	17.6		NV	NP		SM					
10		SS	6		5.2					99.8						
		CA	18		4.8											
15																
20		SS	24													
				— End of Borehole —												
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D23G115

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Plate: 2



Log of Boring: B-3

ELEVATION AND DATUM:

Lat: Long: Elev:ft.

DATE STARTED: 03/09/2023

DATE FINISHED: 03/09/2023

TOTAL DEPTH (ft.): 20

GROUND WATER (ft):
During Drilling: N/A After 48 Hrs:

Project Name: Monaco Park Renovation

ADDRESS: NE Corner of E 56th Ave. & Monaco St.
Commerce City CO 80022

Location: Proposed Shelter

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

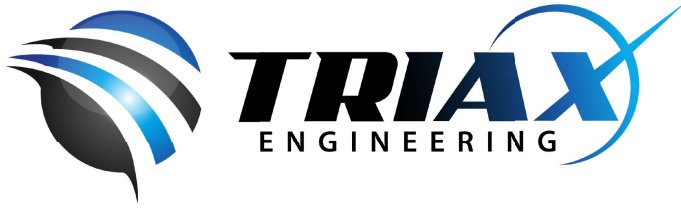
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
													0	20	40	
0				Top Soil / Vegetation	3.8											
		SS	28	Brown Silty Sand	2.9	23.7	-5.3	26	10	114.3	SC	575				
		CA	24	— Moist, Loose to Medium Dense	2.8											
5		SS	8		4.1		-9.6			97.2		139				
		CA	10		4.2											
10		SS	7		4.9	19.7		NV	NP	94.0	SM	146				
		CA	16		4.6											
15																
20		SS	14													
				— End of Borehole —												
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D23G115

Triax Engineering, LLC 5371 Magnolia Street, Commerce City, CO 80022
PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 3



Log of Boring: B-4

ELEVATION AND DATUM:

Lat: _____ Long: _____ Elev:ft. _____

DATE STARTED: 03/09/2023

DATE FINISHED: 03/09/2023

TOTAL DEPTH (ft.): 20

GROUND WATER (ft):
During Drilling: N/A After 48 Hrs: _____

Project Name: Monaco Park Renovation

ADDRESS: NE Corner of E 56th Ave. & Monaco St.
Commerce City CO 80022

Location: Proposed Playground

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
													0	20	40	
0				Top Soil / Vegetation	6.3											
		SS	8	Dark Brown Sandy Clay to Clayey Sand	7.7	65.1	-4.4	26	12	105.0	CL	2921				
		CA	9	— Moist, Medium Stiff												
				— Fill, Up To 12-ft												
5		SS	7	Brown Silty Sand	4.4											
		CA	11	- Moist, Loose to Medium Dense	2.1		-1.3			96.2		96				
10		SS	13	— With Clay Seams and Layers @ 10-ft	27.4	90.8		76	55		CH					
15		CA	15		3.4		-12.2					1793				
20		SS	15		9.6											
25				— End of Borehole —												
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.



Summary of Lab Test Results

Report #: GEOLAB-000001

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Summary of Laboratory Test Results

Bor #	Dep. (ft)	%MC	NDD (pcf)	% Fines	LL (%)	PI (%)	USCS	AASHTO	pH	Su (%Dry Wt.)	Res (Ohm. cm)	UCS (psf)	sw/co n. (%)
B-1	1	9.7	--	--	--	--	--	--	--	--	--	--	--
B-1	3	6.8	109.8	23.0	26	9	SC	A-2-4(0)	--	--	--	240	-2.50
B-1	5	6.5	--	--	--	--	--	--	--	--	--	--	--
B-1	7	4.8	--	--	--	--	--	--	--	--	--	97	--



Summary of Lab Test Results

Report #: GEOLAB-000002

Triax Engineering, LLC
 5371 Magnolia Street
 Commerce City, CO 80022
 Phone: 720.230.1931
 Fax: 720.230.5471

Client:
 DHM Design
 900 South Broadway
 #300
 Denver, CO 80209

Project:
 D23G115
 Monaco Park Renovation
 5790 Monaco St
 Commerce City, CO 80022

Summary of Laboratory Test Results													
Bor #	Dep. (ft)	%MC	NDD (pcf)	% Fines	LL (%)	PI (%)	USCS	AASHTO	pH	Su (%Dry Wt.)	Res (Ohm. cm)	UCS (psf)	sw/co n. (%)
B-2	1	12.8	--	--	--	--	--	--	7.4	0.08	1093	--	--
B-2	5	4.8	--	--	--	--	--	--	--	--	--	--	--
B-2	10	5.9	--	17.6	NV	NV	SM	A-2-4(0)	--	--	--	--	--
B-2	15	5.2	99.8	--	--	--	--	--	--	--	--	--	--
B-2	20	4.8	--	--	--	--	--	--	--	--	--	--	--
B-2	3	3.7	107.4	9.8	23	5	SW-SM	A-2-4(0)	--	--	--	97	-2.10
B-2	7	3.6	112.9	--	--	--	--	--	--	--	--	95	-1.30



Summary of Lab Test Results

Report #: GEOLAB-000003

Triax Engineering, LLC
 5371 Magnolia Street
 Commerce City, CO 80022
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 Fax: 720.230.5471

Client:
 DHM Design
 900 South Broadway
 #300
 Denver, CO 80209

Project:
 D23G115
 Monaco Park Renovation
 5790 Monaco St
 Commerce City, CO 80022

Summary of Laboratory Test Results													
Bor #	Dep. (ft)	%MC	NDD (pcf)	% Fines	LL (%)	PI (%)	USCS	AASHTO	pH	Su (%Dry Wt.)	Res (Ohm. cm)	UCS (psf)	sw/co n. (%)
B-3	1	3.8	--	--	--	--	--	--	--	--	--	--	--
B-3	3	2.9	114.3	23.7	26	10	SC	A-2-4(0)	--	--	--	575	-5.30
B-3	5	2.8	--	--	--	--	--	--	--	--	--	--	--
B-3	7	4.1	97.2	--	--	--	--	--	--	--	--	139	-9.60
B-3	10	4.2	--	--	--	--	--	--	--	--	--	--	--
B-3	15	4.9	94.0	19.7	NV	NV	SM	A-2-4(0)	--	--	--	146	--
B-3	20	4.6	--	--	--	--	--	--	--	--	--	--	--



Summary of Lab Test Results

Report #: GEOLAB-000004

Triax Engineering, LLC
 5371 Magnolia Street
 Commerce City, CO 80022
 Phone: 720.230.1931
 Fax: 720.230.5471

Client:
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 900 South Broadway
 #300
 Denver, CO 80209

Project:
 D23G115
 Monaco Park Renovation
 5790 Monaco St
 Commerce City, CO 80022

Summary of Laboratory Test Results													
Bor #	Dep. (ft)	%MC	NDD (pcf)	% Fines	LL (%)	PI (%)	USCS	AASHTO	pH	Su (%Dry Wt.)	Res (Ohm. cm)	UCS (psf)	sw/co n. (%)
B-4	1	6.3	--	--	--	--	--	--	--	--	--	--	--
B-4	3	7.7	105.0	65.1	26	12	CL	A-6(5)	--	--	--	2921	-4.40
B-4	5	4.4	--	--	--	--	--	--	--	--	--	--	--
B-4	7	2.1	96.2	--	--	--	--	--	--	--	--	96	-1.30
B-4	10	27.4	--	90.8	76	55	CH	A-7-6(55)	--	--	--	--	--
B-4	15	3.4	96.6	--	--	--	--	--	--	--	--	1793	-12.20
B-4	20	9.6	--	--	--	--	--	--	--	--	--	--	--



Swell - Consolidation Test

Report #: SO:SW-000001

Triax Engineering, LLC
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Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

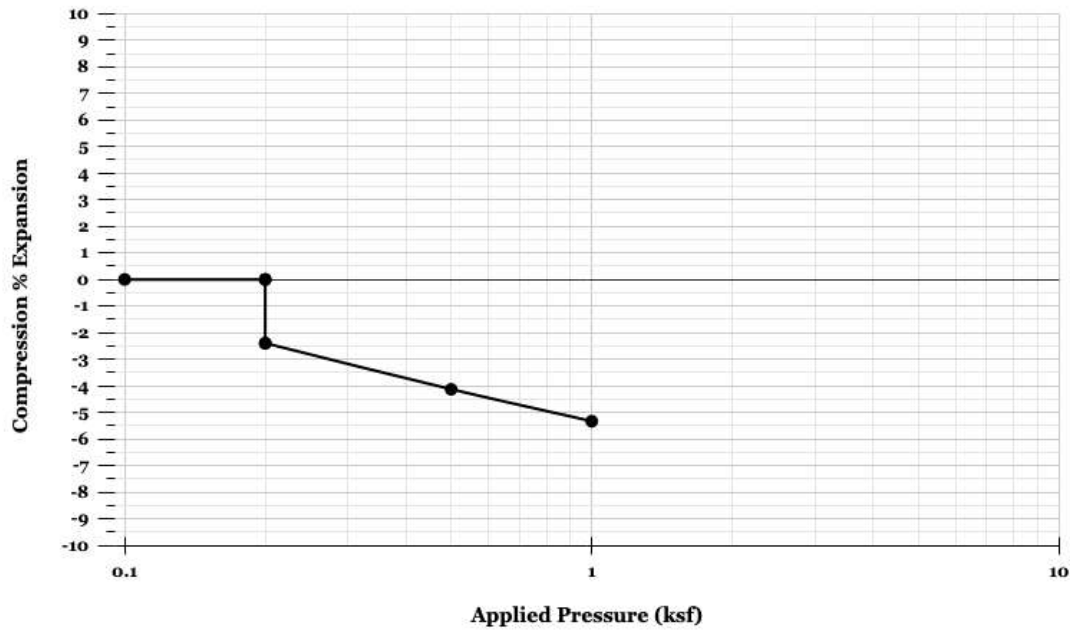
Boring Number: B-1 Sample Number: 6136

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart

Swell / Consolidation



Consolidation due to wetting under constant pressure @ Surcharge Load:200 psf

Moisture Content (%): 6.8 Wet Density of Soil(pcf): 117.3 Dry Density (pcf): 109.8 % Swell / Consolidation: -2.50



Unconfined Compressive Strength

Report #: MF0102-000001

Triax Engineering, LLC
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Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-1

Sample Number: 6136

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 23-0915

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 110.6pcf

Dry Unit Weight (pcf): 103.5pcf

Moisture Content (%): 6.8

Average Height of Specimen (in): 3.975

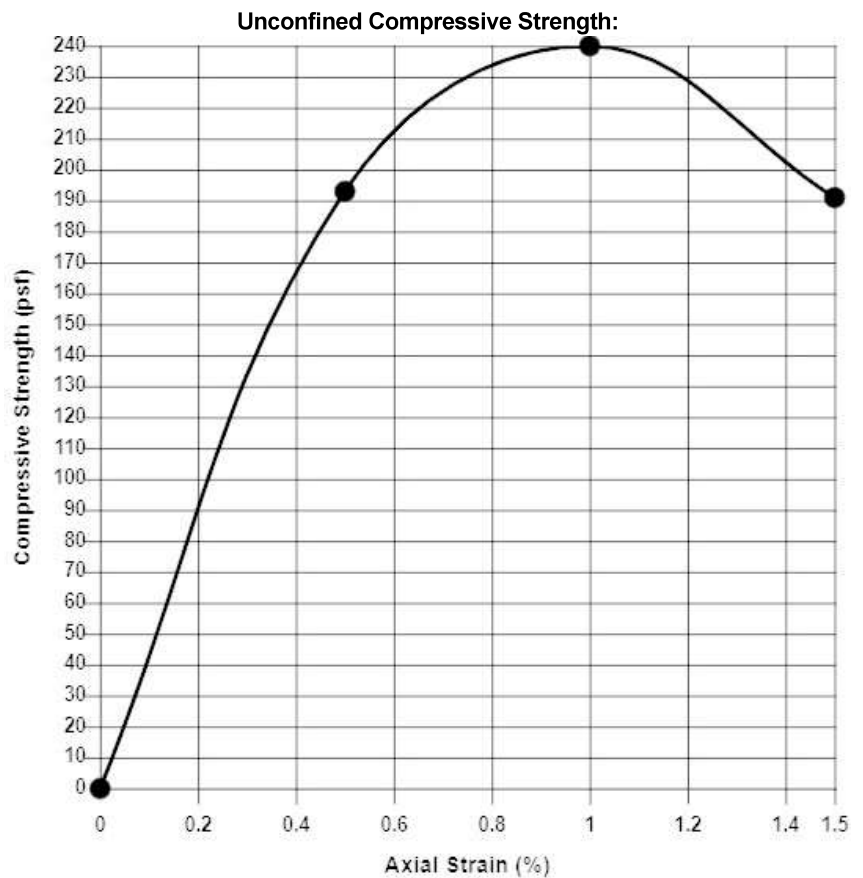
Average Diameter of Specimen (in): 1.944

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 1.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 240





Unconfined Compressive Strength

Report #: MF0102-000002

Triax Engineering, LLC
5371 Magnolia Street
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Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-1

Sample Number: 6136

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 23-0917

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 110.6pcf

Dry Unit Weight (pcf): 105.5pcf

Moisture Content (%): 4.8

Average Height of Specimen (in): 3.968

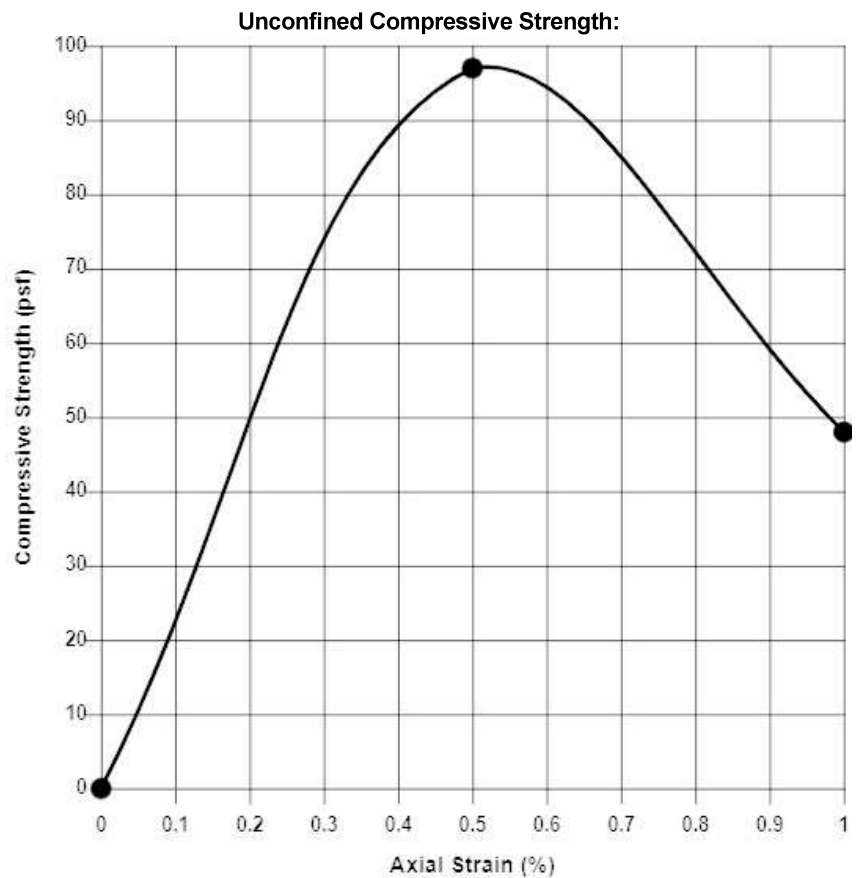
Average Diameter of Specimen (in): 1.941

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 1%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 97





Laboratory Test Results for Soil

Report #: SO:CHE-000001

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
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Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Test Data

Boring Number: B-2

Sample Depth: 1-ft

Triax Soil ID: 23-0918

Water Soluble Sulfates (CPL-2103)

Test Date: 04/06/2023

Sulfate Concentration (ppm): 760

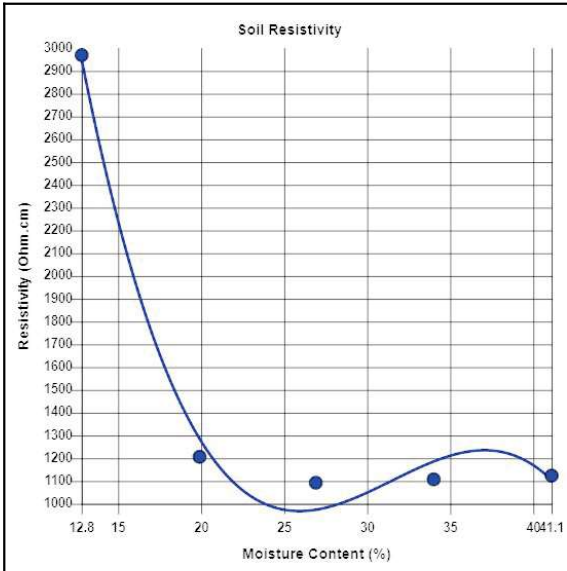
Sulfate Concentration (percent Sulfate in Soil by mass): 0.08

Severity of Potential Exposure (CDOT): Class 1

Soil Resistivity (ASTM G57)

Test Date: 04/06/2023

Resistivity Chart:



Minimum Resistivity Ohm.cm: 1093

Resistivity at In-Situ Moisture Content (Ohm.cm): 2970

pH of Soils (ASTM G51)

Test Date: 04/06/2023

Test Method: Method A (pH Meter)

Water used: De-ionized Water (type ii)

Calcium Chloride Reagent: Stock Solution

Soil pH in Water: 7.4

Soil pH in CaCl₂: 7.2



Sieve Analysis

Report #: SO:SAS-00002

Triax Engineering, LLC
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Phone: 720.230.1931
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Client:
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900 South Broadway
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Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Test Date: 04/06/2023

Lab ID: 23-0919

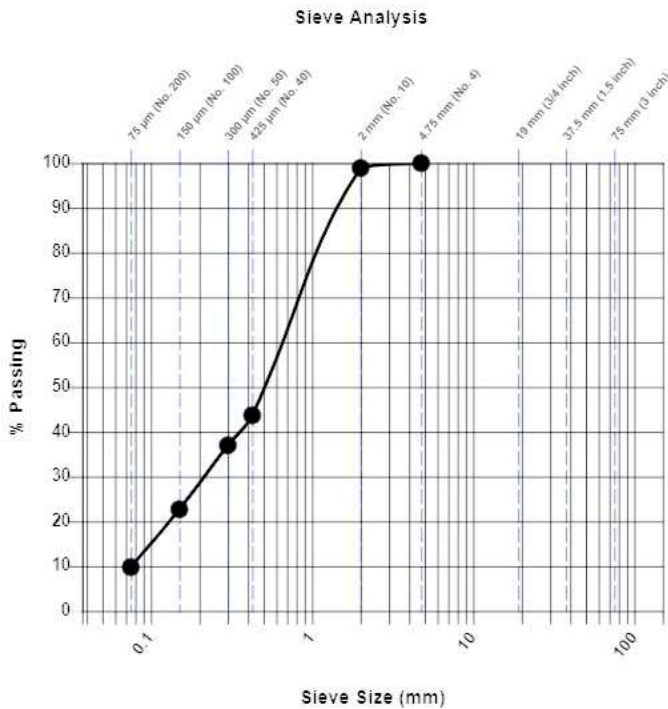
Boring No: B-2

Depth (ft): 3

Soil Description: Brown Well-graded SAND with silt

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
4.75 MM (NO. 4)	100.0
2 MM (NO. 10)	98.9
425 MM (NO. 40)	43.7
300 MM (NO. 50)	37.0
150 MM (NO. 100)	22.7
75 MM (NO. 200)	9.8
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.0

Percent Sand: 90.2

Percent Fines: 9.8

Cu: 6.7

Cc: 1.1

Liquid Limit: 23

Plasticity Index: 5

USCS Classification: SW-SM

AASHTO Classification: A-2-4(0)



Swell - Consolidation Test

Report #: SO:SW-000002

Triax Engineering, LLC
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900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-2 Sample Number: 6137

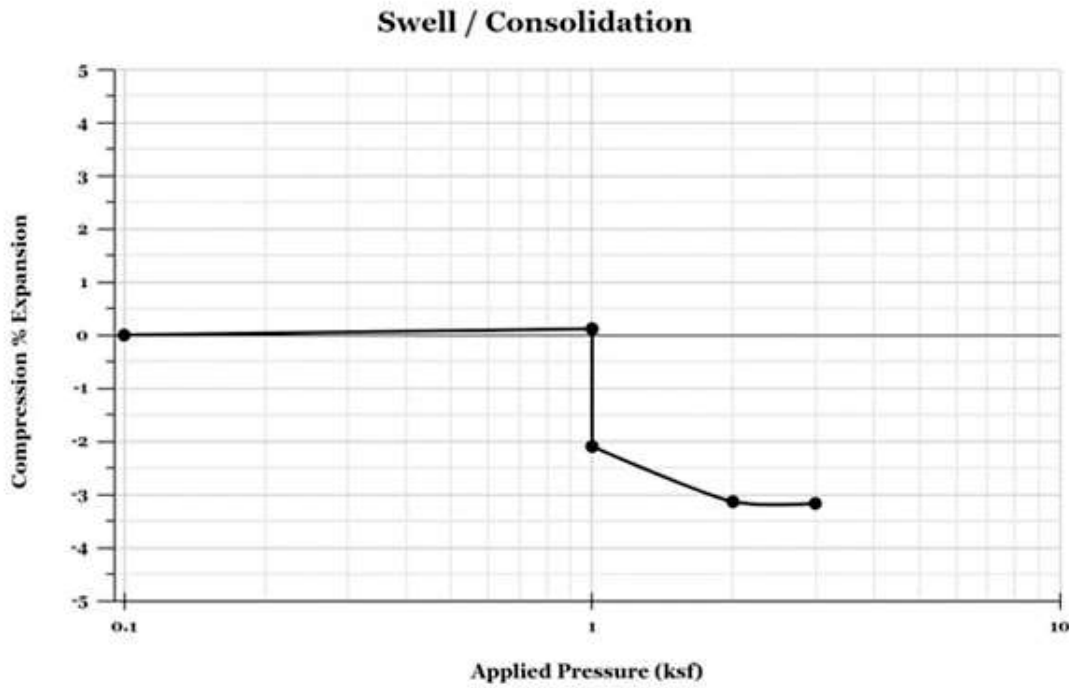
Sample Depth: 3-ft Specimen Number: 2

Test Date: 04/06/2023

Triax Lab ID: 23-0919

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 3.7 Wet Density of Soil(pcf): 111.4 Dry Density (pcf): 107.4 % Swell / Consolidation: -2.10



Unconfined Compressive Strength

Report #: MF0102-000003

Triax Engineering, LLC
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Phone: 720.230.1931
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Client:
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900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-2

Sample Number: 6137

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 23-0919

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 111.6pcf

Dry Unit Weight (pcf): 107.6pcf

Moisture Content (%): 3.7

Average Height of Specimen (in): 3.975

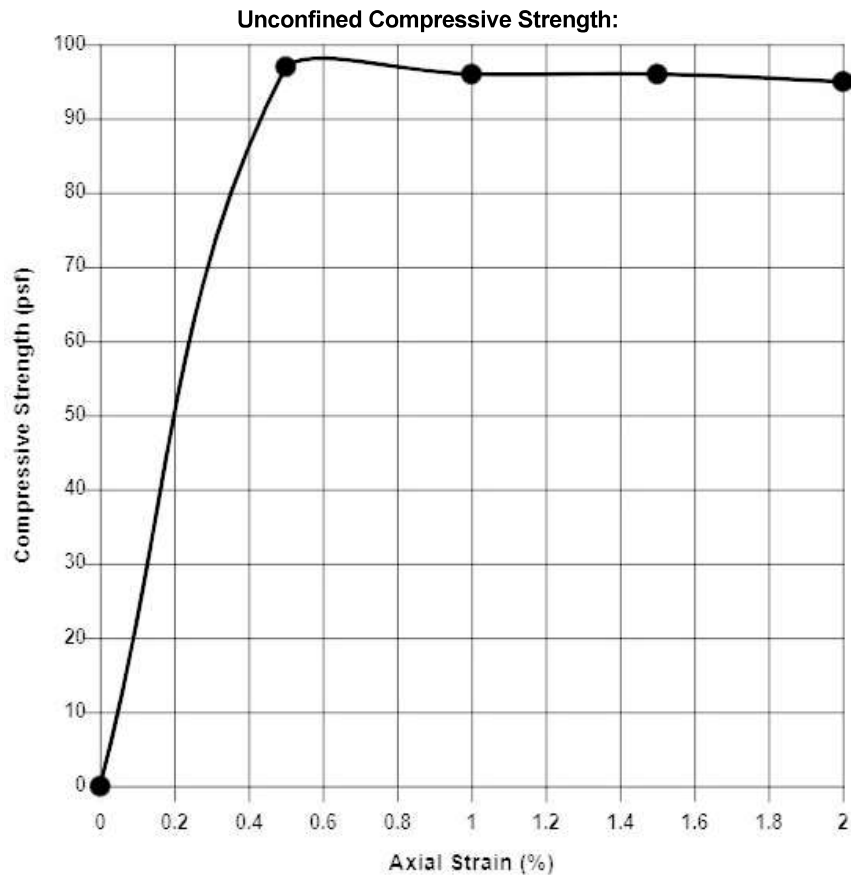
Average Diameter of Specimen (in): 1.943

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 2%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 97





Swell - Consolidation Test

Report #: SO:SW-000003

Triax Engineering, LLC
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Commerce City, CO 80022
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Client:
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900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-2 Sample Number: 6137

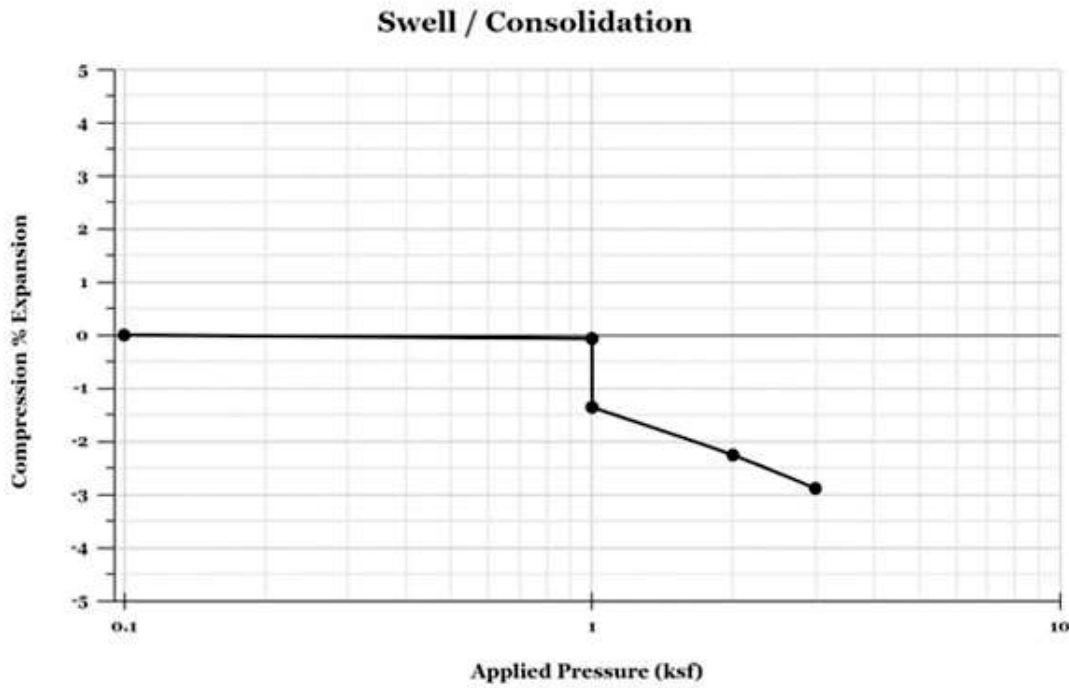
Sample Depth: 7-ft Specimen Number: 4

Test Date: 04/06/2023

Triax Lab ID: 23-0921

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 3.6 Wet Density of Soil(pcf): 117.0 Dry Density (pcf): 112.9 % Swell / Consolidation: -1.30



Unconfined Compressive Strength

Report #: MF0102-000004

Triax Engineering, LLC
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900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-2

Sample Number: 6137

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 23-0921

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 113.9pcf

Dry Unit Weight (pcf): 109.9pcf

Moisture Content (%): 3.6

Average Height of Specimen (in): 3.962

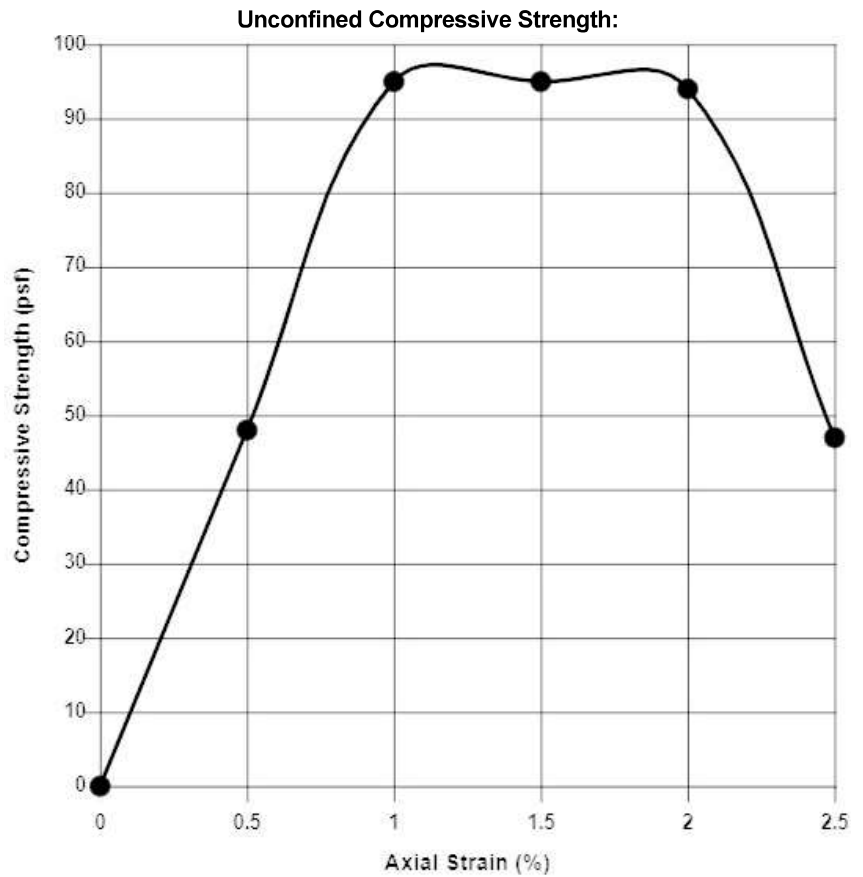
Average Diameter of Specimen (in): 1.953

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 2.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 95





Sieve Analysis

Report #: SO:SAS-000003

Triax Engineering, LLC
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Fax: 720.230.5471

Client:
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Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Test Date: 04/06/2023

Lab ID: 23-0922

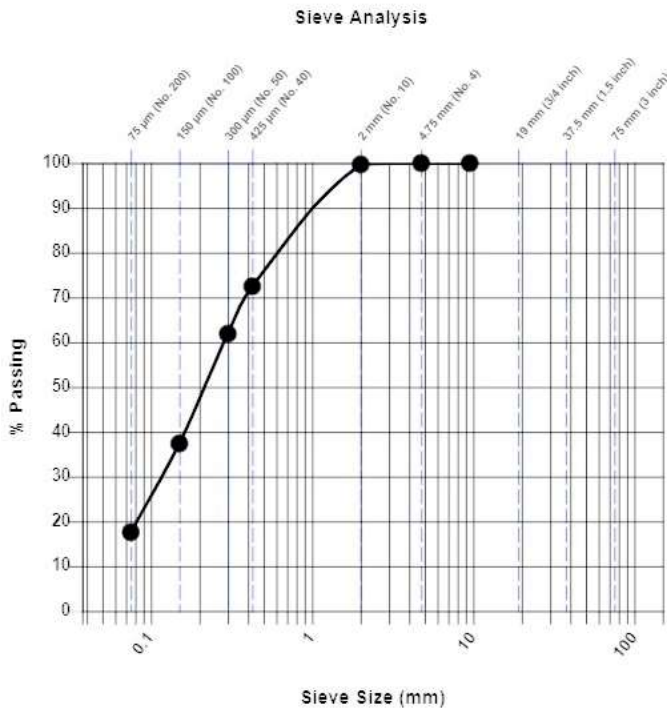
Boring No: B-2

Depth (ft): 10

Soil Description: Brown SILTY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	100.0
2 MM (NO. 10)	99.7
425 MM (NO. 40)	72.5
300 MM (NO. 50)	61.9
150 MM (NO. 100)	37.4
75 MM (NO. 200)	17.6
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.0

Percent Sand: 82.4

Percent Fines: 17.6

Liquid Limit: NV

Plasticity Index: NV

USCS Classification: SM

AASHTO Classification: A-2-4(0)



Unconfined Compressive Strength

Report #: MF0102-000005

Triax Engineering, LLC
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Commerce City, CO 80022
Phone: 720.230.1931
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Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-2

Sample Number: 6137

Sample Depth: 15-ft

Specimen Number: 6

Triax Soil ID: 23-0923

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 116.9pcf

Dry Unit Weight (pcf): 111.2pcf

Moisture Content (%): 5.2

Average Height of Specimen (in): 3.985

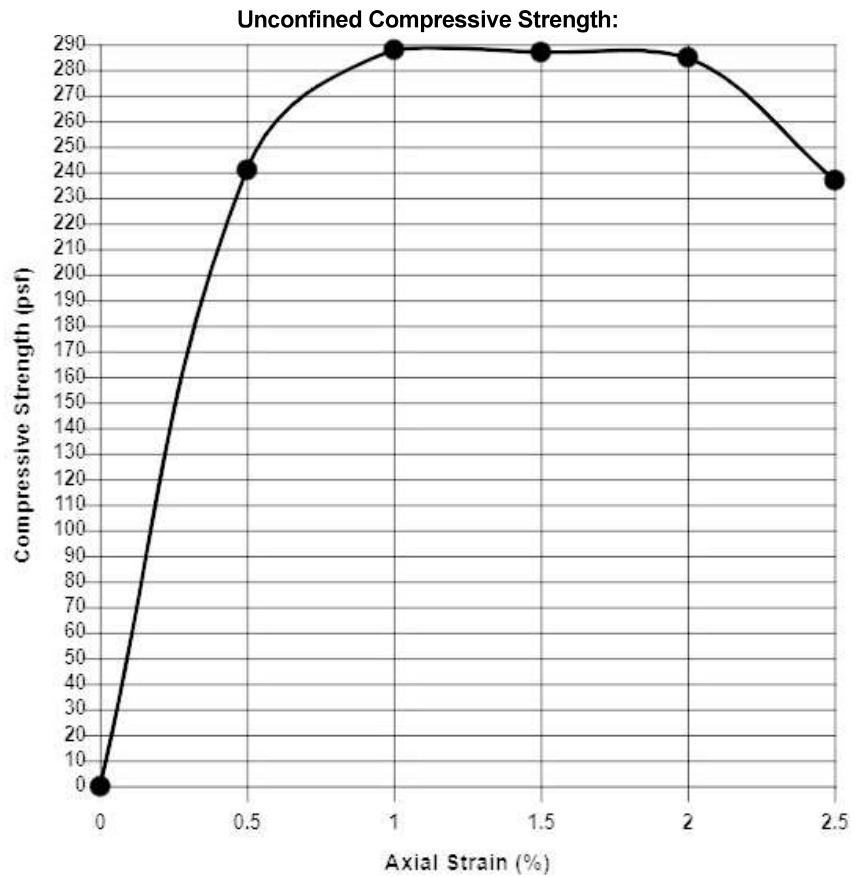
Average Diameter of Specimen (in): 1.944

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 2.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 288





Sieve Analysis

Report #: SO:SAS-000004

Triax Engineering, LLC
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 Fax: 720.230.5471

Client:
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 900 South Broadway
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 Denver, CO 80209

Project:
 D23G115
 Monaco Park Renovation
 5790 Monaco St
 Commerce City, CO 80022

Test Date: 04/06/2023

Lab ID: 23-0926

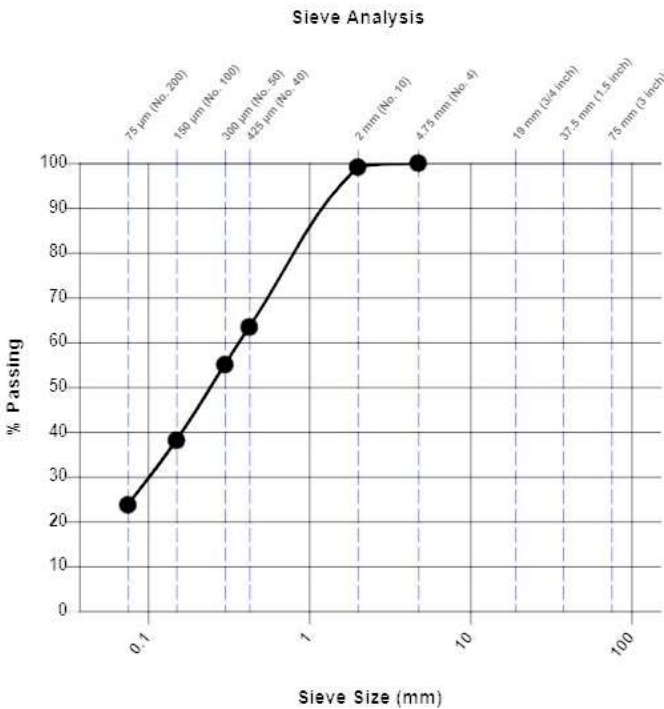
Boring No: B-3

Depth (ft): 3

Soil Description: Brown CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
4.75 MM (NO. 4)	100.0
2 MM (NO. 10)	99.1
425 MM (NO. 40)	63.4
300 MM (NO. 50)	55.0
150 MM (NO. 100)	38.1
75 MM (NO. 200)	23.7
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.0

Percent Sand: 76.3

Percent Fines: 23.7

Liquid Limit: 26

Plasticity Index: 10

USCS Classification: SC

AASHTO Classification: A-2-4(0)



Unconfined Compressive Strength

Report #: MF0102-000006

Triax Engineering, LLC
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Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

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DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-3

Sample Number: 6138

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 23-0926

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 113.4pcf

Dry Unit Weight (pcf): 110.2pcf

Moisture Content (%): 2.9

Average Height of Specimen (in): 3.963

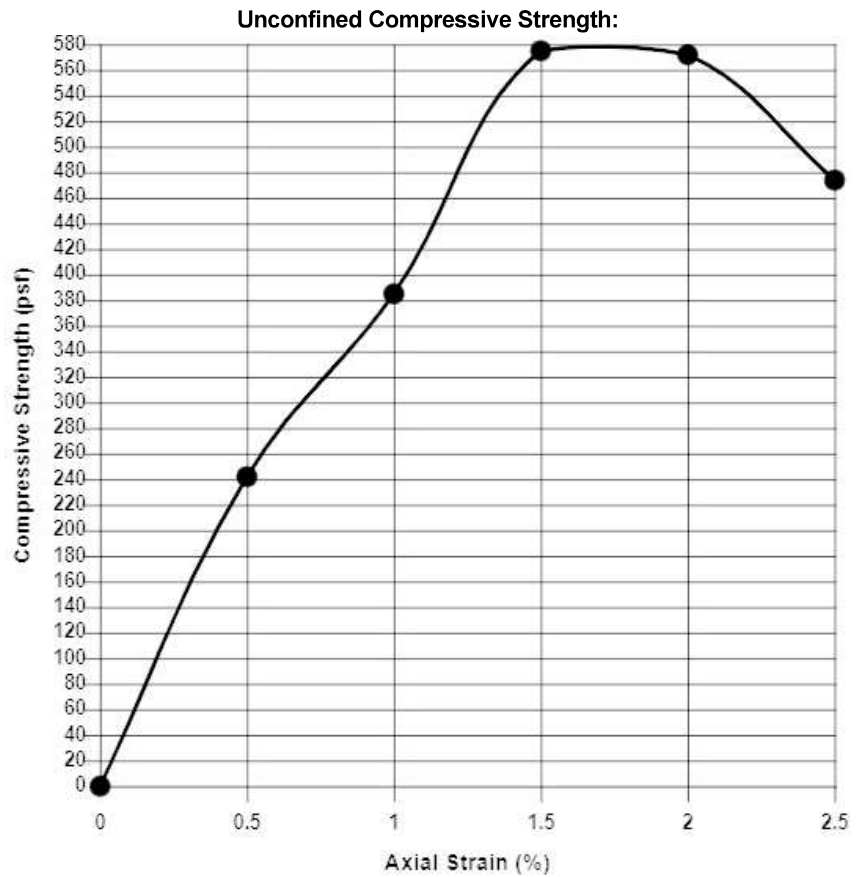
Average Diameter of Specimen (in): 1.941

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 2.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 575





Swell - Consolidation Test

Report #: SO:SW-000004

Triax Engineering, LLC
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900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-3 Sample Number: 6138

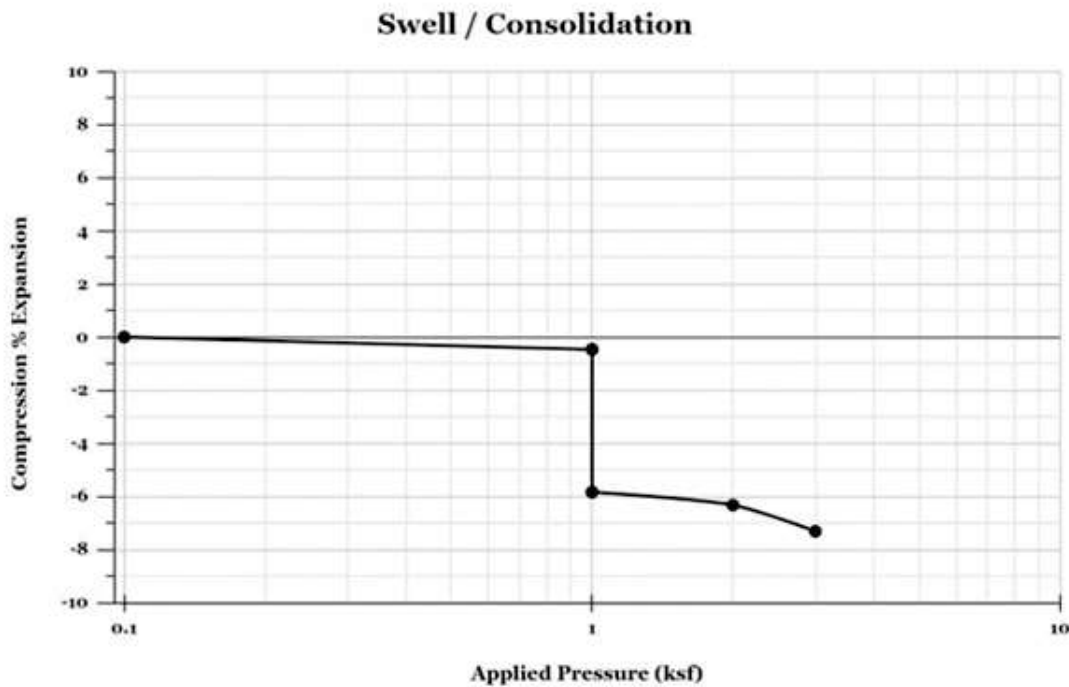
Sample Depth: 3-ft Specimen Number: 2

Test Date: 04/06/2023

Triax Lab ID: 23-0926

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 2.9 Wet Density of Soil(pcf): 117.6 Dry Density (pcf): 114.3 % Swell / Consolidation: -5.30



Swell - Consolidation Test

Report #: SO:SW-000005

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-3 Sample Number: 6138

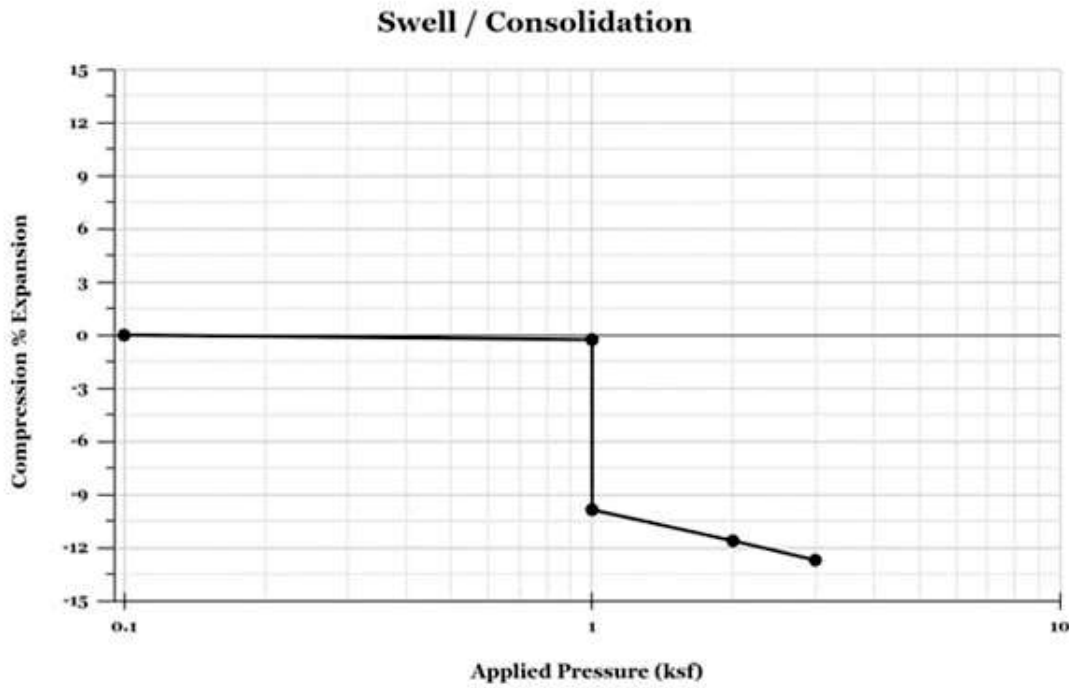
Sample Depth: 7-ft Specimen Number: 4

Test Date: 04/06/2023

Triax Lab ID: 23-0928

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 4.1 Wet Density of Soil(pcf): 101.2 Dry Density (pcf): 97.2 % Swell / Consolidation: -9.60



Unconfined Compressive Strength

Report #: MF0102-000007

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-3

Sample Number: 6138

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 23-0928

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 99.5pcf

Dry Unit Weight (pcf): 95.5pcf

Moisture Content (%): 4.1

Average Height of Specimen (in): 3.952

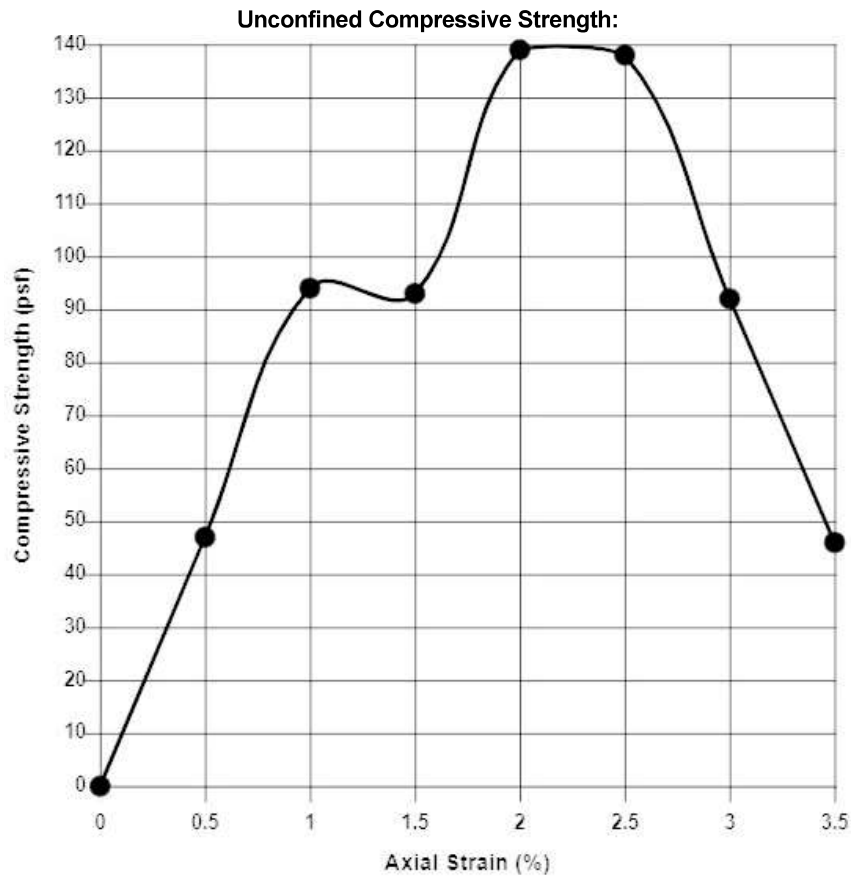
Average Diameter of Specimen (in): 1.969

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 3.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 139





Sieve Analysis

Report #: SO:SAS-000005

Triax Engineering, LLC
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 Commerce City, CO 80022
 Phone: 720.230.1931
 Fax: 720.230.5471

Client:
 DHM Design
 900 South Broadway
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 Denver, CO 80209

Project:
 D23G115
 Monaco Park Renovation
 5790 Monaco St
 Commerce City, CO 80022

Test Date: 04/06/2023

Lab ID: 23-0930

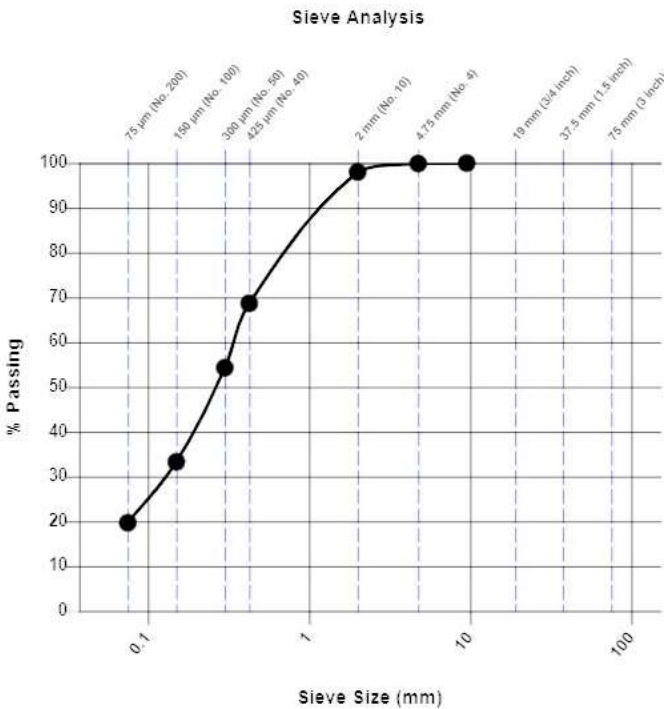
Boring No: B-3

Depth (ft): 15

Soil Description: Brown SILTY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	99.9
2 MM (NO. 10)	98.0
425 MM (NO. 40)	68.7
300 MM (NO. 50)	54.3
150 MM (NO. 100)	33.3
75 MM (NO. 200)	19.7
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.1

Percent Sand: 80.2

Percent Fines: 19.7

Liquid Limit: NV

Plasticity Index: NV

USCS Classification: SM

AASHTO Classification: A-2-4(0)



Unconfined Compressive Strength

Report #: MF0102-000008

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-3

Sample Number: 6138

Sample Depth: 15-ft

Specimen Number: 6

Triax Soil ID: 23-0930

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 115.5pcf

Dry Unit Weight (pcf): 110.1pcf

Moisture Content (%): 4.9

Average Height of Specimen (in): 3.971

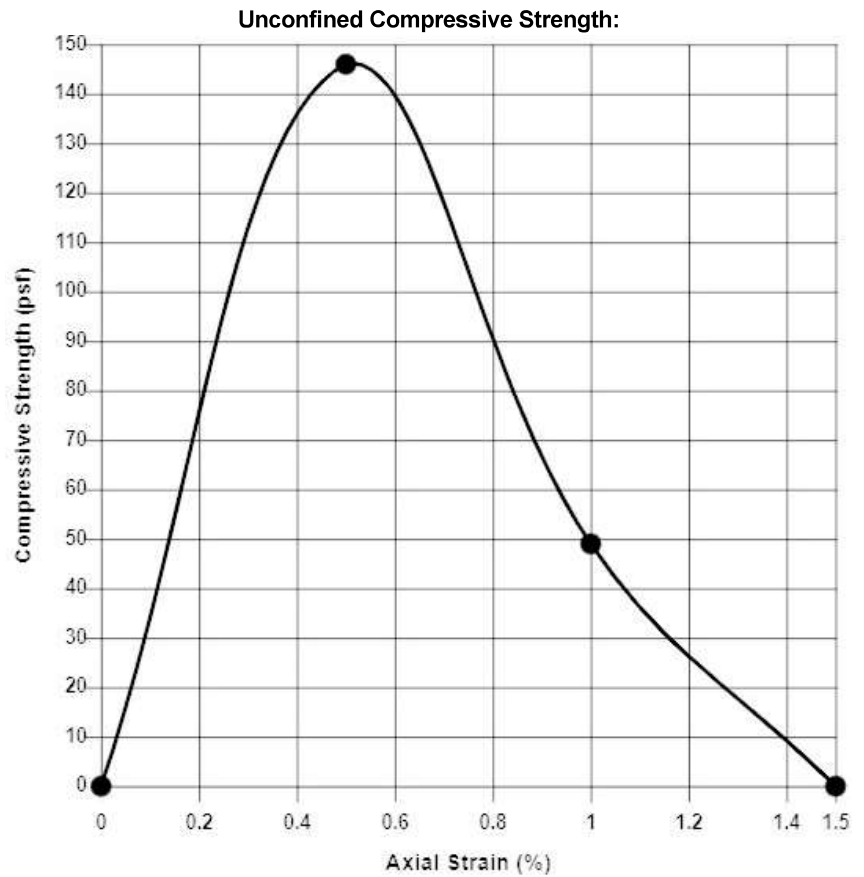
Average Diameter of Specimen (in): 1.933

Height to Diameter Ratio of Specimen: 2.1

Strain at Failure (%): 1.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 146





Triax Engineering, LLC
 5371 Magnolia Street
 Commerce City, CO 80022
 Phone: 720.230.1931
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Client:
 DHM Design
 900 South Broadway
 #300
 Denver, CO 80209

Project:
 D23G115
 Monaco Park Renovation
 5790 Monaco St
 Commerce City, CO 80022

Test Date: 04/06/2023

Lab ID: 23-0933

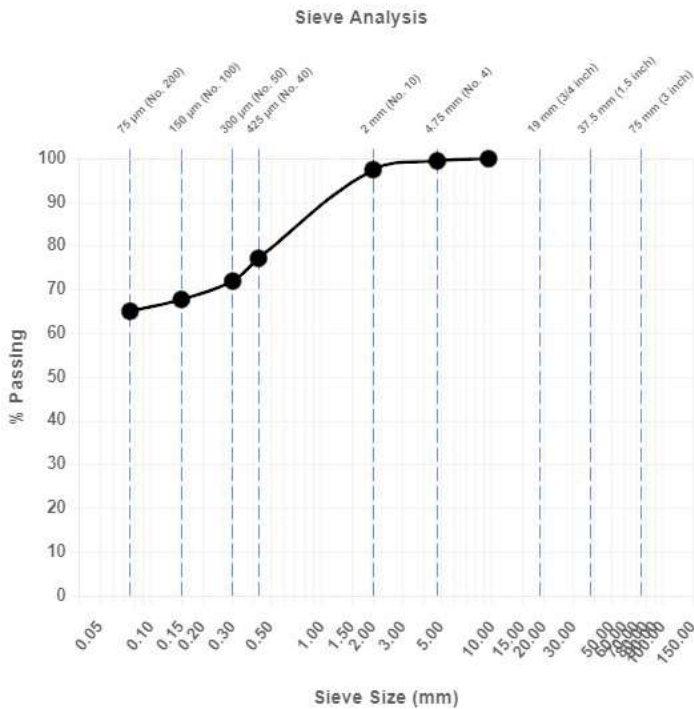
Boring No: B-4

Depth (ft): 3

Soil Description: Brown Sandy LEAN CLAY

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	99.5
2 MM (NO. 10)	97.5
425 MM (NO. 40)	77.2
300 MM (NO. 50)	72.0
150 MM (NO. 100)	67.8
75 MM (NO. 200)	65.1
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.5

Percent Sand: 34.4

Percent Fines: 65.1

Liquid Limit: 26

Plasticity Index: 12

USCS Classification: CL

AASHTO Classification: A-6(5)



Swell - Consolidation Test

Report #: SO:SW-000006

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-4 Sample Number: 6140

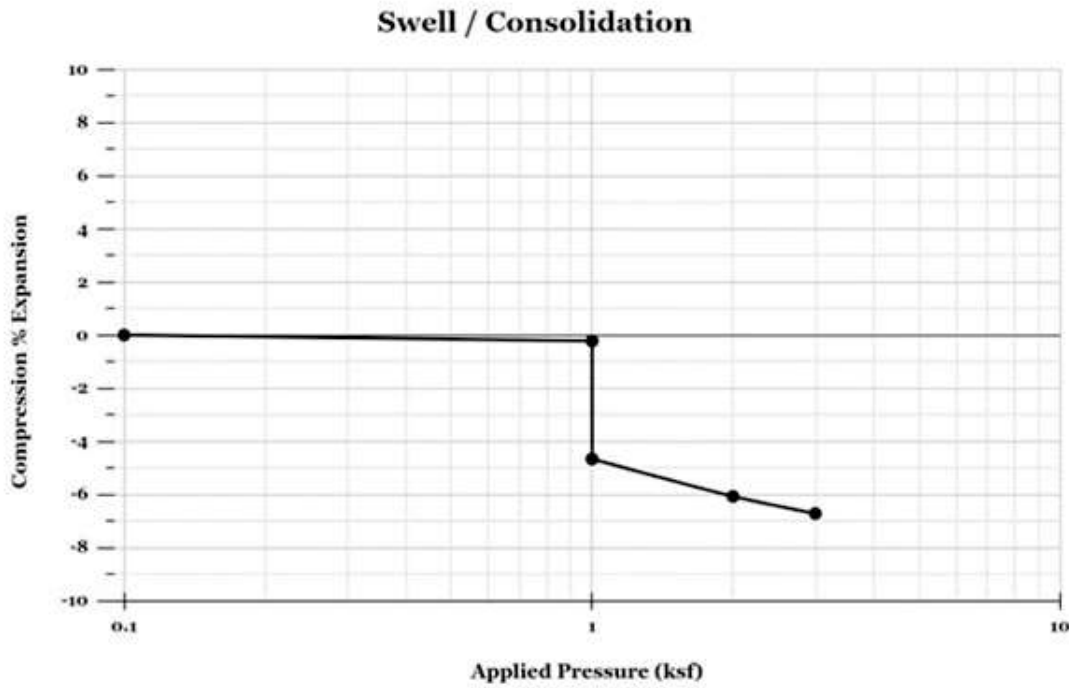
Sample Depth: 3-ft Specimen Number: 2

Test Date: 04/06/2023

Triax Lab ID: 23-0933

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 7.7 Wet Density of Soil(pcf): 113.1 Dry Density (pcf): 105.0 % Swell / Consolidation: -4.40



Unconfined Compressive Strength

Report #: MF0102-000009

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-4

Sample Number: 6140

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 23-0933

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 128.7pcf

Dry Unit Weight (pcf): 119.5pcf

Moisture Content (%): 7.7

Average Height of Specimen (in): 3.975

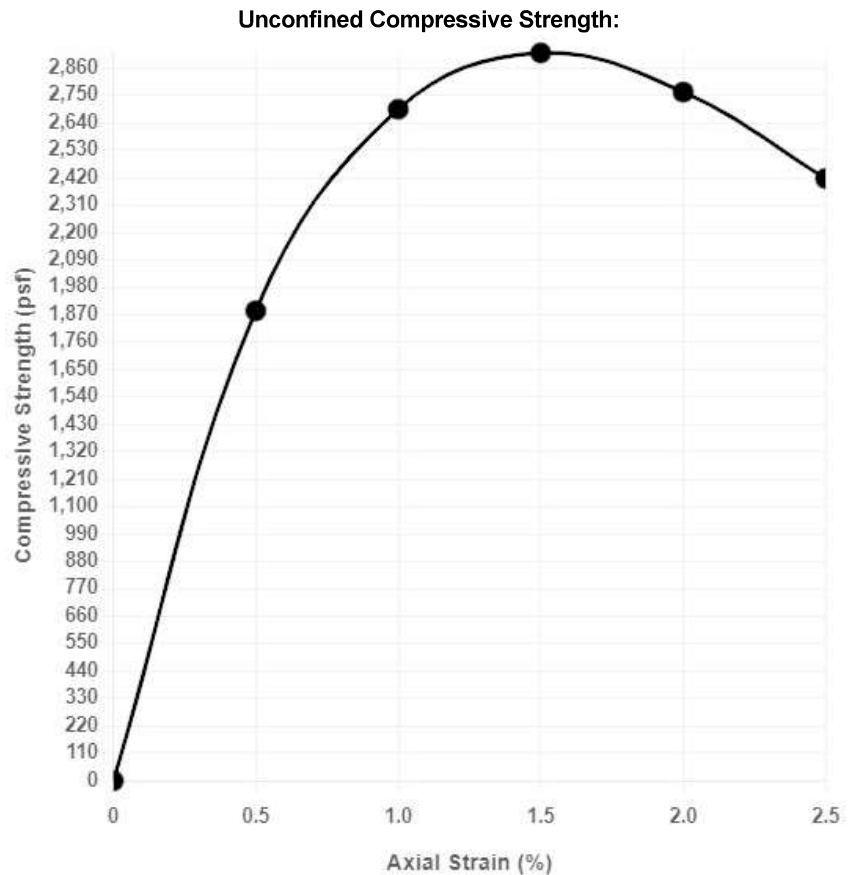
Average Diameter of Specimen (in): 1.942

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 2.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 2921





Swell - Consolidation Test

Report #: SO:SW-000007

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-4 Sample Number: 6140

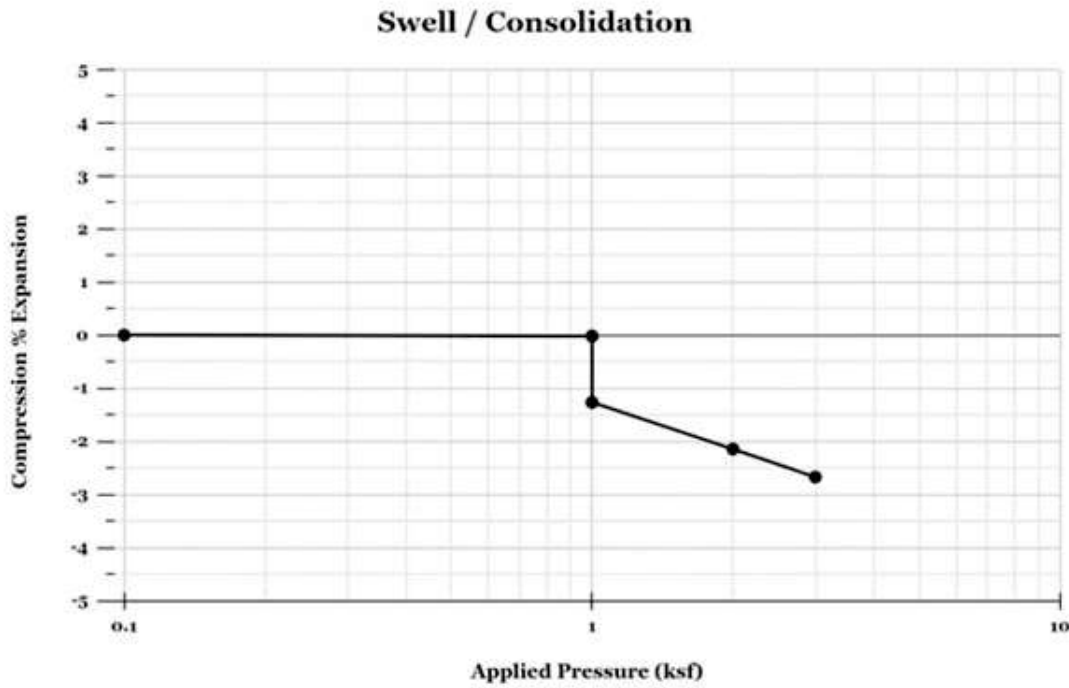
Sample Depth: 7-ft Specimen Number: 4

Test Date: 04/06/2023

Triax Lab ID: 23-0935

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 2.1 Wet Density of Soil(pcf): 98.2 Dry Density (pcf): 96.2 % Swell / Consolidation: -1.30



Unconfined Compressive Strength

Report #: MF0102-000010

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-4

Sample Number: 6140

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 23-0935

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 108.1pcf

Dry Unit Weight (pcf): 105.9pcf

Moisture Content (%): 2.1

Average Height of Specimen (in): 3.973

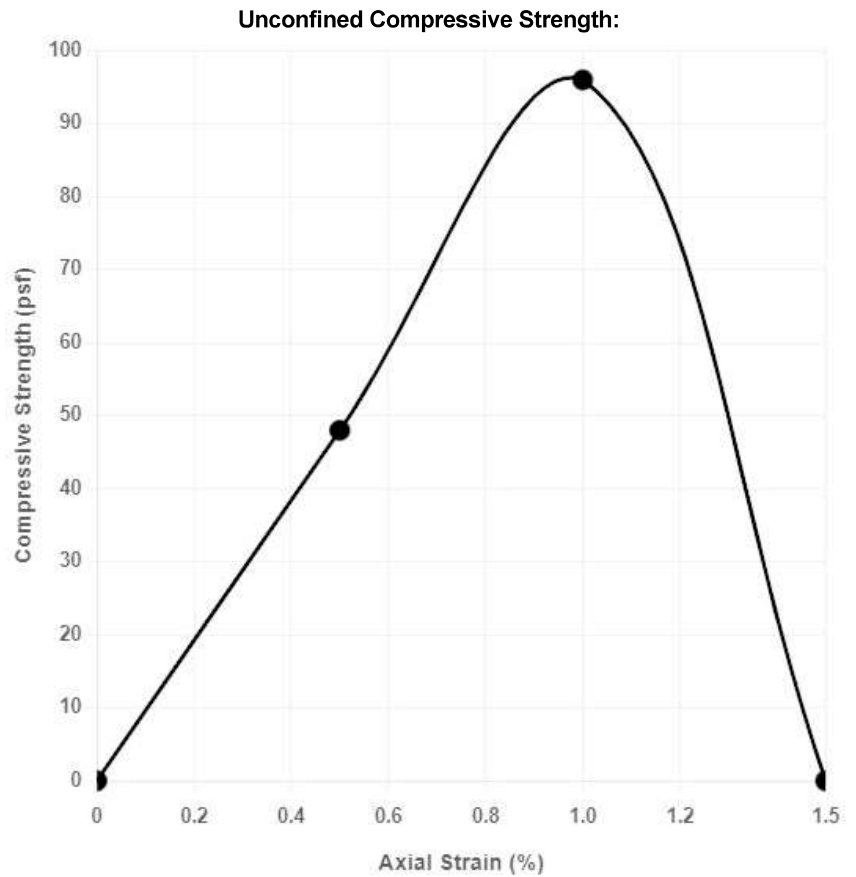
Average Diameter of Specimen (in): 1.944

Height to Diameter Ratio of Specimen: 2.0

Strain at Failure (%): 1.5%

Strain Rate(%): 1.00

Unconfined Compressive Strength (psf): 96





Sieve Analysis

Report #: SO:SAS-00007

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Test Date: 04/06/2023

Lab ID: 23-0936

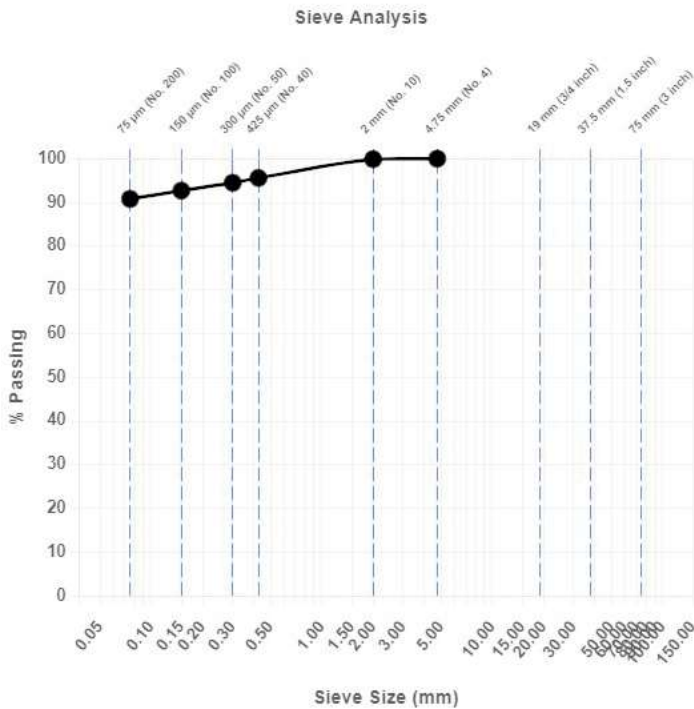
Boring No: B-4

Depth (ft): 10

Soil Description: Brown FAT CLAY

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
4.75 MM (NO. 4)	100.0
2 MM (NO. 10)	99.9
425 MM (NO. 40)	95.6
300 MM (NO. 50)	94.5
150 MM (NO. 100)	92.7
75 MM (NO. 200)	90.8
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.0

Percent Sand: 9.2

Percent Fines: 90.8

Liquid Limit: 76

Plasticity Index: 55

USCS Classification: CH

AASHTO Classification: A-7-6(55)



Swell - Consolidation Test

Report #: SO:SW-000008

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-4 Sample Number: 6140

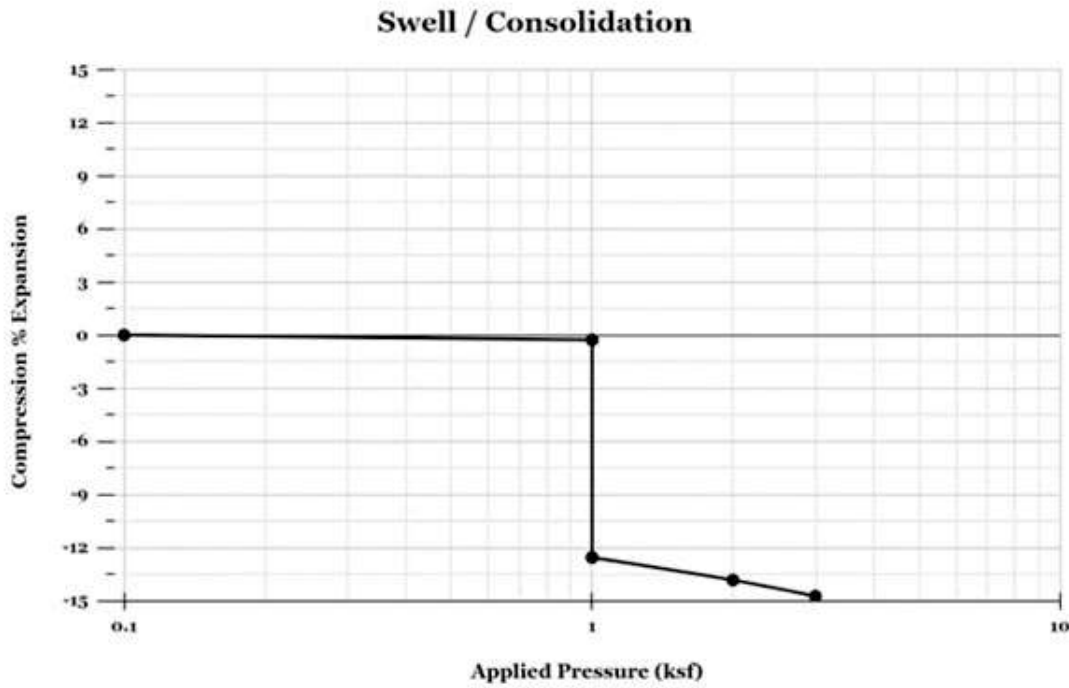
Sample Depth: 15-ft Specimen Number: 6

Test Date: 04/06/2023

Triax Lab ID: 23-0937

Soil Description: Dark Brown Clayey Sand

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load: 1000 psf

Moisture Content (%): 3.4 Wet Density of Soil(pcf): 99.9 Dry Density (pcf): 96.6 % Swell / Consolidation: -12.20



Unconfined Compressive Strength

Report #: MF0102-000011

Triax Engineering, LLC
5371 Magnolia Street
Commerce City, CO 80022
Phone: 720.230.1931
Fax: 720.230.5471

Client:
DHM Design
900 South Broadway
#300
Denver, CO 80209

Project:
D23G115
Monaco Park Renovation
5790 Monaco St
Commerce City, CO 80022

Boring Number: B-4

Sample Number: 6140

Sample Depth: 15-ft

Specimen Number: 6

Triax Soil ID: 23-0937

Test Date: 04/06/2023

Soil Description: Dark Brown Clayey Sand

Specimen Type: Intact

Wet Unit Weight (pcf): 113.6pcf

Dry Unit Weight (pcf): 109.8pcf

Moisture Content (%): 3.4

Average Height of Specimen (in): 3.963

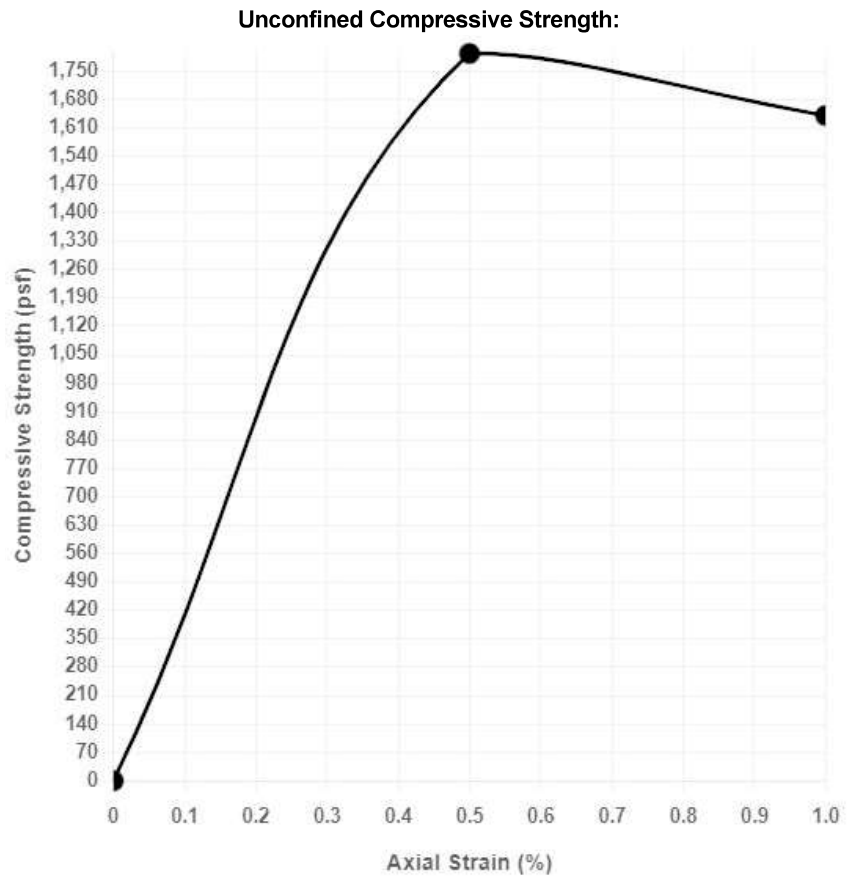
Average Diameter of Specimen (in): 1.940


Height to Diameter Ratio of Specimen: 2.0


Strain at Failure (%): 1%


Strain Rate(%): 1.00


Unconfined Compressive Strength (psf): 1793




Location	Monaco Park Renovation				
20-year Equivalent Single Axle Load Applications (ESAL)	14,500				
Soil Sample Information:					
Boring	B-1 to B-4		Depth	1 to 7	feet
Sample description	SC/SM				
USCS	SC/SM	AASHTO Group Number	AASHTO Group Index:		
Pavement Thickness Calculation Input Parameters:					
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841		
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0		
Design R-value, R	14	Equiv. Daily Load App. (EDLA)	--		
M _R =	4060				
Design Structural Number:	2				
OPTION A -Light Duty (Parking) (ESAL=14500)					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Commerce City - Hot Bituminous Pavement	0.4	1	5	2.00
					2.00
OPTION B -Light Duty (Parking) (ESAL =14500)					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Commerce City - Hot Bituminous Pavement	0.4	1	4	1.60
2	Commerce City - Aggregate Base Course	0.12	1	4	0.48
					2.08
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO.	D23G115
		Monaco Park Renovation		FIGURE NO. P-1A	

Location	Monaco Park Renovation				
20-year Equivalent Single Axle Load Applications (ESAL)					25,000
Soil Sample Information:					
Boring	B-1 to B-4		Depth	1 to 7 feet	
Sample description	Brown Clayey/Silty Sand				
USCS	SC/SM	AASHTO Group Number	AASHTO Group Index:		
Pavement Thickness Calculation Input Parameters:					
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841		
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0		
Design R-value, R	14	Equiv. Daily Load App. (EDLA)	--		
M _R =	4060				
Calculated Design Structural Number:		2.19			
<u>OPTION D - Medium Duty (Drive) (ESAL=25000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Commerce City - Hot Bituminous Pavement	0.4	1	5 1/2	2.20
					2.20
<u>OPTION E - Medium Duty (Drive) (ESAL =25000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Commerce City - Hot Bituminous Pavement	0.4	1	4	1.60
2	Commerce City - Aggregate Base Course	0.12	1	5	0.60
					2.20
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO.	D23G115	
	Monaco Park Renovation		FIGURE NO. P-1A		

Location	Monaco Park Renovation				
20-year Equivalent Single Axle Load Applications (ESAL)	45,000				
Soil Sample Information:					
Boring	B-1 to B-4		Depth	1 to 7 feet	
Sample description	Brown Clayey/Silty Sand				
USCS	SC/SM	AASHTO Group Number	AASHTO Group Index:		
Pavement Thickness Calculation Input Parameters:					
Reliability Level (%)	80.0	Standard Normal Deviate, Zr	-0.841		
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0		
Design R-value, R	14	Equiv. Daily Load App. (EDLA)	--		
M _R =	4060				
Calculated Design Structural Number: 2.41					
<u>OPTION G - Heavy Duty (Drive) (ESAL=45000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Commerce City - Hot Bituminous Pavement	0.4	1	6 1/2	2.60
					2.60
<u>OPTION H - Heavy Duty (Drive) (ESAL=45000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Commerce City - Hot Bituminous Pavement	0.4	1	4	1.60
2	Commerce City - Aggregate Base Course	0.12	1	7	0.84
					2.44
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO.	D23G115
		Monaco Park Renovation		FIGURE NO. P-1A	

Location	Monaco Park Renovation			
20-year Equivalent Single Axle Load Applications (ESAL)				
Soil Sample Information:				
Boring	B-1 to B-4		Depth	1 to 7 feet
Sample description		Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group Number		AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:				
Terminal Serviceability, Pt	2.0	Modulus of Rupture, S _c (psi)		600.000
Modulus of Elasticity, E _c (psi)	3400000.00	Modulus of Subgrade Reaction, k		125.0
Reliability Level (%)	90.0	Overall Standard Deviation, S _o		0.340
Load Transfer Coefficient, J	4.2	Loss of Support, LS		2.0
Standard Normal Deviate, Z _r	-0.674	Drainage Coefficient, C _d		1.0
Design Serviceability Loss, ΔPSI	2.5			
<u>OPTION- C LIGHT DUTY (PARKING) (ESAL =14500)</u>				
Layer	Material Desc.	Design SN	Thickness (in.)	Calculated SN
1	Rigid Pavement	4.16	5	5.00
				5.00
<u>OPTION- F MEDIUM DUTY (Drive) (ESAL =25000)</u>				
Layer	Material Desc.	Design SN	Thickness (in.)	Calculated SN
1	Rigid Pavement	4.40	5	5.00
				5.00
<u>OPTION- I Heavy Duty (Drive) (ESAL =45000)</u>				
Layer	Material Desc.	Design SN	Thickness (in.)	Calculated SN
1	Rigid Pavement	4.65	6	5.41
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D23G115
		Monaco Park Renovation		FIGURE NO. P-1B

Location	Monaco Park Renovation		
20-year Equivalent Single Axle Load Applications (ESAL)	14500		
Light Duty (Parking)			
Soil Sample Information:			
Boring	B-1 to B-4	Depth	1 to 7 feet
Sample description	Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group	Nun A-2-4 (0)
		AASHTO Group Index:	
Pavement Thickness Calculation Input Parameters:			
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0
Design R-value, R	14.0	Equiv. Daily Load App. (EDLA)	--
Design CBR	0.0		
Resilient Modulus Calculation:			
S ₁ = [(R - 5) / 11.29 + 3]	=	3.797	Mr = 2555 x (CBR) ^{0.64} = 0
M _R = 10 ^[(S₁ + 18.72) / 6.24]			
M _R =	4060		
Design R-value based on removal and replacement. If proof rolling cannot be achieved, stabilization may be required.			
Pavement Thickness Calculation:			
Log ₁₀ (18kESAL) =	$[Z_R \times S_o] + [9.36 \times \log_{10}(SN + 1) - 0.20 + \frac{\log_{10}(DPSI/(4.2 - 1.5))}{(0.4+1094/(SN+1)^{3.19})} + [2.32 \times \log_{10}(MR)] - 8.07]$		
select Structural layer coeff:	Commerce City - Hot Bituminous Pavement		
Structural layer coeff:	0.4		
select Base layer1 coeff:	Commerce City - Aggregate Base Course		
select Base layer 1 coeff:	0.12		
select Base layer2 coeff:			
select Base layer 2 coeff:			
"A"	"B"		
4.161368	<	4.165432	
SN= 2	(Choose SN such that "A" is less than "B")		
Pavement Thickness:			
Option A	Option B		
5	4	inches of Commerce City - Hot Bituminous Pavement SC=0.4	
	4	inches of Commerce City - Aggregate Base Course SC=0.12	
		inches of SC=	
2	2.08	0	
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS - FULL DEPTH	JOB NO. D23G115
Monaco Park Renovation		FIGURE NO. P-1B	

Location	Monaco Park Renovation	
20-year Equivalent Single Axle Load Applications (ESAL)	25000	

Medium Duty (Drive)

Soil Sample Information:			
Boring	B-1 to B-4	Depth	1 to 7 feet
Sample description	Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group Number	A-2-4 (0)
		AASHTO Group Index:	

Pavement Thickness Calculation Input Parameters:

Reliability Level (%)	80.0	Standard Normal Deviate, Zr	-0.841
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0
Design R-value, R	14.0	Equiv. Daily Load App. (EDLA)	--
Design CBR	0.0		

Resilient Modulus Calculation:

$$S_1 = [(R - 5) / 11.29 + 3] = 3.797 \quad M_r = 2555 \times (CBR)^{0.64} = 0$$

$$M_R = 10^{[(S_1 + 18.72) / 6.24]}$$

$$M_R = 4060$$

Design R-value based on removal and replacement. If proof rolling cannot be achieved, stabilization may be required.

Pavement Thickness Calculation:

$$\log_{10}(18kESAL) = [Z_r \times S_o] + [9.36 \times \log_{10}(SN + 1) - 0.20 + \frac{\log_{10}(DPSI/(4.2 - 1.5))}{(0.4+1094/(SN+1)^{3.19})}] + [2.32 \times \log_{10}(MR)] - 8.07$$

select Structural layer coeff: Commerce City - Hot Bituminous Pavement
 Structural layer coeff: 0.4
 select Base layer1 coeff: Commerce City - Aggregate Base Course
 select Base layer 1 coeff: 0.12
 select Base layer2 coeff:
 select Base layer 2 coeff:


"A" "B"
 4.39794001 < **4.40456888**


SN= 2.19 (Choose SN such that "A" is less than "B")


Pavement Thickness:


Option A	Option B	
5.5	4	
	5	
2.2	2.2	0

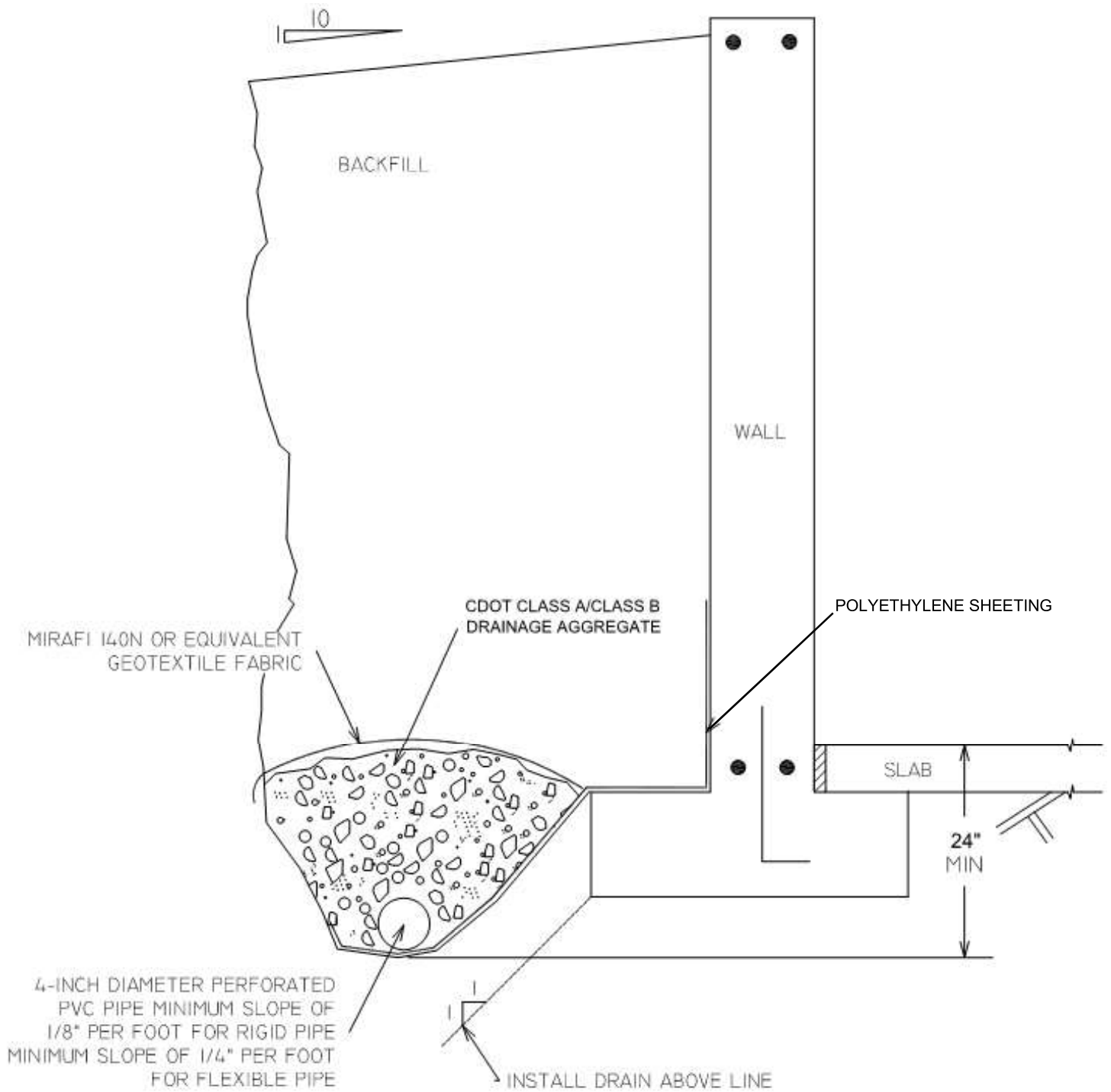
inches of Commerce City - Hot Bituminous Pavement SC=0.4
 inches of Commerce City - Aggregate Base Course SC=0.12
 inches of SC=

Location	Monaco Park Renovation		
20-year Equivalent Single Axle Load Applications (ESAL)	45000		
Heavy Duty (Drive)			
Soil Sample Information:			
Boring	B-1 to B-4	Depth	1 to 7 feet
Sample description	Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group Number	A-2-4 (0)
		AASHTO Group Index:	
Pavement Thickness Calculation Input Parameters:			
Reliability Level (%)	80.0	Standard Normal Deviate, Zr	-0.841
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0
Design R-value, R	14.0	Equiv. Daily Load App. (EDLA)	--
Design CBR			
Resilient Modulus Calculation:			
$S_1 = [(R - 5) / 11.29 + 3]$	= 3.797	$M_r = 2555 \times (CBR)^{0.64}$	= 0
$M_R = 10^{[(S_1 + 18.72) / 6.24]}$			
$M_R =$	4060		
Design R-value based on removal and replacement. If proof rolling cannot be achieved, stabilization may be required.			
Pavement Thickness Calculation:			
$\log_{10}(18kESAL) =$	$\frac{[Z_R \times S_o] + [9.36 \times \log_{10}(SN + 1) - 0.20 + \log_{10}(DPSI/(4.2 - 1.5))]}{(0.4+1094/(SN+1)^{3.19})}$		
	+ [2.32 x log ₁₀ (MR)] - 8.07		
select Structural layer coeff:	Commerce City - Hot Bituminous Pavement		
Structural layer coeff:	0.4		
select Base layer1 coeff:	Commerce City - Aggregate Base Course		
select Base layer 1 coeff:	0.12		
select Base layer2 coeff:			
select Base layer 2 coeff:			
"A"	"B"		
4.653212514	<	4.661129028	
SN= 2.41	(Choose SN such that "A" is less than "B")		
Pavement Thickness:			
Option A	Option B		
6.5	4	inches of Commerce City - Hot Bituminous Pavement SC=0.4	
	7	inches of Commerce City - Aggregate Base Course SC=0.12	
		inches of SC=	
2.6	2.44	0	
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS - FULL DEPTH	JOB NO. D23G115
		Monaco Park Renovation	FIGURE NO. P-1B

Location	Monaco Park Renovation		
20-year Equivalent Single Axle Load Applications (ESAL)	14500		
Soil Sample Information:			
Boring	B-1 to B-4		Depth 1 to 7 feet
Sample description	Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group Number	A-2-4 (0) AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Terminal Serviceability, P _t	2.0	Modulus of Rupture, S' _c (psi)	600
Modulus of Elasticity, E _c (psi)	3,400,000	Modulus of Subgrade Reaction, k	125
Reliability Level (%)	90.0	Overall Standard Deviation, S _o	0.34
Load Transfer Coefficient, J	4.2	Drainage Coefficient, C _d	1.0
Standard Normal Deviate, Z _T	-0.674	Loss of Support, LS	2.0
Design Serviceability Loss, DPSI	2.5		
Pavement Thickness Calculation:			
$\text{Log}_{10}(18\text{kESAL}) = Z_R \times S_o + 7.35 \times \log_{10}(D + 1) - 0.06 + \frac{\log_{10}(\text{DPSI}/(4.5 - 1.5))}{(1+1.624 \times 10^7 / (D+1))^{8.46}}$ $+ (4.22 - 0.32 \times p) \times \log_{10}(S'_c \times C_D \times (D^{0.75} - 1.132) / (215.63 \times J \times (D^{0.75} - 18.42 / (E_c/k) \times 0.25)))$			
"A"		"B"	
4.161368002	<	5.003541241	
D= 5		(Choose D such that "A" is less than "B")	
Pavement Thickness:			
5 inches of portland cement concrete (Min used)			
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D23G115
	Monaco Park Renovation		FIGURE NO. P-1

Location	Monaco Park Renovation		
20-year Equivalent Single Axle Load Applications (ESAL)	25000		
Soil Sample Information:			
Boring	B-1 to B-4		Depth 1 to 7 feet
Sample description	Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group Number	A-2-4 (0) AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Terminal Serviceability, P _t	2.0	Modulus of Rupture, S' _c (psi)	600
Modulus of Elasticity, E _c (psi)	3,400,000	Modulus of Subgrade Reaction, k	125
Reliability Level (%)	90.0	Overall Standard Deviation, S _o	0.34
Load Transfer Coefficient, J	4.2	Drainage Coefficient, C _d	1.0
Standard Normal Deviate, Z _r	-0.674	Loss of Support, LS	2.0
Design Serviceability Loss, DPSI	2.5		
Pavement Thickness Calculation:			
$\text{Log}_{10}(18\text{kESAL}) = Z_R \times S_o + 7.35 \times \log_{10}(D + 1) - 0.06 + \frac{\log_{10}(\text{DPSI}/(4.5 - 1.5))}{(1+1.624 \times 10^7 / (D+1))^{8.46}}$ $+(4.22 - 0.32 \times p_t) \times \log_{10}(S'_c \times C_D \times (D^{0.75} - 1.132) / (215.63 \times J \times (D^{0.75} - 18.42 / (E_c/k) \times 0.25)))$			
"A"	"B"		
4.39794001	<	5.00354124	
D= 5	(Choose D such that "A" is less than "B")		
Pavement Thickness:			
5 inches of portland cement concrete (Min used)			
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D23G115
	Monaco Park Renovation		FIGURE NO. P-1

Location	Monaco Park Renovation		
20-year Equivalent Single Axle Load Applications (ESAL)	45000		
Soil Sample Information:			
Boring	B-1 to B-4		Depth 1 to 7 feet
Sample description	Brown Clayey/Silty Sand		
USCS	SC/SM	AASHTO Group Number	A-2-4 (0) AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Terminal Serviceability, P _t	2.5	Modulus of Rupture, S' _c (psi)	600
Modulus of Elasticity, E _c (psi)	3,400,000	Modulus of Subgrade Reaction, k	125
Reliability Level (%)	90.0	Overall Standard Deviation, S _o	0.34
Load Transfer Coefficient, J	4.2	Drainage Coefficient, C _d	1.0
Standard Normal Deviate, Z _r	-0.674	Loss of Support, LS	2.0
Design Serviceability Loss, DPSI	2.0		
Pavement Thickness Calculation:			
$\text{Log}_{10}(18\text{kESAL}) = Z_R \times S_o + 7.35 \times \text{log}_{10}(D + 1) - 0.06 + \frac{\text{log}_{10}(\text{DPSI}/(4.5 - 1.5))}{(1+1.624 \times 10^7/(D+1)^{8.46})}$			
$+(4.22-0.32 \times p) \times \text{log}_{10}(S'_c \times C_D \times (D^{0.75} - 1.132) / (215.63 \times J \times (D^{0.75} - 18.42 / (E_c/k) \times 0.25)))$			
"A"	"B"		
4.653212514	<	5.405189048	
D= 6	(Choose D such that "A" is less than "B")		
Pavement Thickness:			
6 inches of portland cement concrete			
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D23G115
	Monaco Park Renovation		FIGURE NO. P-1






















NOTES:

1. DRAIN PIPE SHOULD LEAD TO SUMP OR POSITIVE GRAVITY DISCHARGE.
2. COVER GRAVEL COMPLETELY WITH GEOTEXTILE IN SANDY OR SILTY SOILS.
3. BOTTOM OF DRAIN SHOULD BE A MINIMUM OF 24 INCHES BELOW TOP OF SLAB AT HIGH POINT.



TYPICAL EXTERIOR PERIMETER DRAIN

KEY TO CLASSIFICATION SYMBOLS USED ON BORING LOGS

MAJOR DIVISIONS			GROUP SYMBOLS	DESCRIPTIONS	
COARSE-GRAINED SOILS More Than Half of Material LARGER Than No. 200 Sieve size	GRAVELS More Than Half of Coarse Fraction is LARGER Than No. 4 Sieve Size	Gravels Clean Gravels (Little or no Fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
		Gravels Clean Gravels (Little or no Fines)	GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
		Gravels With Fines (Appreciable Amount of Fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
		Gravels With Fines (Appreciable Amount of Fines)	GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS More Than Half of Coarse Fraction is SMALLER Than No. 4 Sieve Size	Sands Clean Sands (Little or no Fines)	SW		Well-Graded Sands, Gravelly Sands, Little or no Fines
		Sands Clean Sands (Little or no Fines)	SP		Poorly-Graded Sands, Gravelly Sands, Little or no Fines
		Sands With Fines (Appreciable Amount of Fines)	SM		Silty Sands, Sand-Silt Mixtures
		Sands With Fines (Appreciable Amount of Fines)	SC		Clayey Sands, Sand-Clay Mixtures
	FINE-GRAINED SOILS More Than Half of Material is SMALLER Than No. 200 Sieve Size.	SILTS & CLAYS Liquid Limit Less Than 50	ML		Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
SILTS & CLAYS Liquid Limit Greater Than 50		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts	
		CH		Inorganic Clays of High Plasticity, Fat Clays	
FORMATIONAL MATERIALS	SANDSTONE				
	SILTSTONE				
	CLAYSTONE				
	SHALE				
	IGNEOUS BEDROCK				
	METAMORPHIC BEDROCK				
GROUNDWATER				Indicates Final Observed Groundwater Level Indicates Initial Observed Groundwater Location	

GENERAL NOTES

Consistency of Fine – Grained Soils

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration Blow Counts (N-Value)</u>	<u>Consistency</u>
<500	0-1	Very Soft
500-1000	2-4	Soft
1000-2000	4-8	Medium Stiff
2000-4000	8-15	Stiff
4000-8000	15-30	Very Stiff
8000+	>30	Hard

Relative Density of Coarse Grained Soils

<u>Standard Penetration Blow Counts (N-Value)</u>	<u>Consistency</u>
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
>50	Very Dense

Grain Size Terminology

<u>Terminology</u>	<u>Nominal Particle Size</u>
Boulders	Over 12 inch (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 Sieve (75mm to 4.75mm)
Sand	#4 to #200 Sieve (4.75 mm to 0.075 mm)
Silt/Clay	Passing #200 Sieve (<0.075mm)

Plasticity Description

<u>Term</u>	<u>PI Range</u>
Non Plastic	0
Low Plasticity	1-10
Medium Plasticity	11-30
High Plasticity	>30

Slab Performance Risk

<u>Slab Performance Risk Category</u>	<u>Representative % Swell (500 psf Surcharge)</u>	<u>Representative % Swell (1000 psf Surcharge)</u>
Low	0 to <3	0 to <2
Moderate	3 to <5	2 to <4
High	5 to <8	4 to <6
Very High	≥8	≥6

The data collected by Triax Engineering, LLC during this investigation was used to provide geotechnical information and recommendations regarding subsurface conditions on the site investigated, the effect of those conditions on the proposed construction, and the foundation type for the named client. The stratification lines indicated on the boring log are approximate, and subsurface conditions encountered during construction may differ from those presented herein. This uncertainty cannot be eliminated because of the many variability's associated with geology. For example material and engineering characteristics of soil and bedrock may change more gradually or more quickly indicated in this report and the actual engineering properties of non-sampled soil or rock may differ from interpretations. Quantitative conclusions regarding the performance of geotechnical structures prior to construction are not possible because of the complexity of subsurface conditions. Rather, engineering judgments and experience are used to estimate likely geotechnical performance and provide the necessary recommendations. Put another way, we cannot be sure about what is not visible, so the collected data and our training and experience are used to develop predictions and recommendations. There are no guarantees or warranties implied or expressed.

The owner and/or client must understand that uncertainties are associated with geotechnical engineering, and they, the owner and/or client, must determine the level of risk they are willing to accept for the proposed construction. The risks can be reduced, but not eliminated, through more detailed investigation, which costs more money and takes more time, and through any appropriate construction, which might be recommended as a result of that, more detailed investigation. To reduce the level of uncertainty, this report was prepared only for the referenced client and for the proposed construction indicated in the report. Unless authorized by us in writing, the owner will assume additional geotechnical risk if this report is used for any construction that differs from that indicated in the report. Our firm should be consulted well before changes in the proposed construction occur, such as the nature, size, configuration, orientation, or location of any improvements. Additionally, the knowledge and experience of the local geotechnical practice is continually expanding and it must be understood the presented recommendations were made according to the standard of practice at the time of report issuance. If the construction occurs 1 or more years after issuance of the report, the owner and/or client should contact our firm to determine if additional investigation or revised recommendations would be advisable.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



Telephone: 301/565-2733

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**Department of Parks, Recreation & Golf
Monaco Park Renovation**


Project: PRG-02-2023
ADDENDUM NO. 01

The following Mandatory Pre-bid Sign in sheet is attached.

This Addendum is dated August 4, 2023.

ITEM #1

Mandatory Pre-bid Sign In Sheet:



Monaco Park Renovation Project Pre-bid Meeting August 3, 2023 10:00am					
Name	Company Name	Address	Phone Number	Email Address	GC
Tony Jaramillo	City of Commerce City	—		tjaramillo@c3gov.com	
AARON FINE	KCI	600 Weaver Park Rd 1540 Fremont Drive	720 818 1213	brds@kciconst.com	X
THOMAS THOMAS	DESIGNSCAPES	1540 Fremont Drive	303-721-9003	TThomas@designscapes.org	X
MATTHEW WHIPPLE	DHM			BNEUMANN@DHMDSIGN.COM	
CHRIS MURPHY	ECI		(970) 702-1053	chris.murphy@ecisite.net	X
Michael Michael	AtoZ Rec		480-229-9895	michael@atozrec.com	
Chris Klausner	Elite Industries	535 S. Gilbert St Castle Rock, CO	970-766-6033	chris@eliteindustriesinc.com	✓
RYAN NEBLEY	GOODLANDS CONSTRUCTION	760 NILE ST GOLDEN CO	303-278-8100	RYAN@GOODLANDS CONSTRUCTION.COM	X
Molly HATHORN	Recreation Plus		303-892-5020	molly@recreationplus.com	

Commerce City
Department of Parks, Recreation & Golf
Monaco Park Renovation
Project: PRG-02-2023
ADDENDUM NO. 02

This Addendum is dated August 15, 2023

Item#

1. Possible to get the bid form in excel format?
Response: The Bid Form is in Word, not Excel. Attached is Bid Form in Word format.

2. There isn't any info regarding the round paver plaza near the playground
Response: Refer to note on detail 1/L5.1, "Decorative pavers to be Pavestone-Plaza IV circle pavers, color: Three Tone Brown." These pavers are designed for layout in a circular pattern, also refer to Section 02780 Unit Pavers. Some cutting of pavers may be required.

3. The bid form lacks a line item for the concrete under the PIP
Response: The playground 4" concrete subbase installation is to be included in Bid Item #40.

Bid Item #40- Playground Installation

Note: The City of Commerce City will purchase the playground equipment directly from the play equipment vendor including installation of equipment and poured in place rubber surfacing. The contractor will be responsible for coordinating with the vendor and preparing subgrade, 4" concrete subbase, concrete playground curb and gravel sump pits.

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be at the contract lump sum price, to include coordination with playground vendor, grading, all materials, labor and equipment necessary to install 4-inch thick concrete, grading, sub grade preparation, base course, gravel sump pits, formwork, fiber-reinforcement per the specifications, concrete, finishing, backfill along paving, disposal of excess excavated material for a complete installation.

4. **For Clarification: Add the following note #8 to plan sheet L3.0:**
Contractor to field verify exact depth of the existing playpit. The existing playpit may have engineered wood fiber (EWF) chips from 12" to 18"+ depth. Following removal of EWF from the playpit, contractor shall backfill as required to accommodate proposed finished grade.

5. Are "approved substitutes" acceptable?
Response: All Bids are to be based on what is shown in the drawings, in an effort to keep bidding "apples-to-apples".

6. Regarding this bid, can you please clarify if bids are to be submitted in hard copy or can they be submitted online? If online, do we submit through BidNet or by email? In the RFB, it states:

“Sealed bids will be received online or at the Bison Ridge Recreation Center, 13905 E. 112th. Ave. Commerce City, CO 80022, until 3 p.m. MST, Friday, August 25, 2023, at which time bids will be publicly opened and read. Bidders are invited, but are not required, to attend the bid opening”.

Response: As mentioned and shown in the power point presentation at the Mandatory Prebid meeting.

- *“Bids will be submitted August 25th. By 3:00 pm. either online to Tony Jaramillo, Parks Capital Projects Manager, tjaramillo@c3gov.com or hand delivered to the Bison Ridge Recreation Center, 13905 E. 112th. Ave. Commerce City CO, 80022”.*

7. Attachment F/Special Conditions has a different project name. Can you confirm that this page applies to the Monaco Park Renovation?

Response: Yes, Attachment F/Special Conditions does apply to the Monaco Park Renovation Project. Corrected Page attached.

8.

- a. What is the water source for the drinking fountain?
- b. Do we need a separate tap for the drinking fountain?
- c. Where is the waste water being drained to?
- d. Detail of the Drain?

Response: There is an existing 1” tap that feeds the existing drinking fountain near the NE corner of site. Reroute pipe/ connect existing tap for new drinking fountain. The size of the concrete pad at the drinking fountain has also been update to accommodate ADA (see attached plan exhibit from sheet L2.0). See attached revised detail (2/L5.4) with stop and waste and drainage sump pit for waste water.