



## **Department of Parks, Recreation & Golf**

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

# **FRONTERRA PARK**

**Project: PRG-03-2014**

## **Contract**

**Book Number:** \_\_\_\_\_

**October 2014**

**CITY OF COMMERCE CITY**

# CITY OF COMMERCE CITY

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### ADVERTISEMENT FOR BIDS

#### ANNOUNCEMENT FOR RECEIVING OF BIDS

Deadline for submitting Bids to the City:

**October 30, 2014  
1:00 p.m. (local time)**

**Plans by City:** Construction of a new 18.5 acre park including but not limited to playground, shelters, restroom, parking lot, concrete trails, landscaping, irrigation, lighting and site furnishings. The location of the Fronterra Park project is 10020 Joplin Street, Commerce City, Colorado.

Magnitude of the project is estimated between \$1.9 million and \$2.1 million.

Bids must be submitted at the City's Recreation Center located at 6060 Parkway Drive, Commerce City, CO 80022. A five percent (5%) Bid Bond for base bid in the form of a cashier's check or certified check is required at the time of Bid. One hundred percent (100%) Performance Bond and Payment Bond (2 separate bonds must be submitted) are required prior to Contract Execution.

Plans and specifications are available at <http://www.rockymountainbidsystem.com/>. The Document Number is "ITB-TJ-CCRC-FP"

**Instruction to Bidders:** This project is funded through Commerce City's \$137 million capital improvement program is the result of a November 2013 voter-approved sales and use tax increase that provides a dedicated revenue stream for new parks, recreation and road projects into the future.

Please see attached documents and include all required information along with the attached documents with your bid proposal:

- Construction Plans
- Contract Bid Documents

#### **Scope of Work Includes the Following:**

##### Base Bid

1. General Conditions/Mobilization
2. Site Demolition
3. Clearing and Grubbing
4. Erosion Control
5. Site Grading
6. Concrete Paving
7. Concrete Curbs
8. Site Utilities
9. Irrigation System
10. Native Seeding

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11. Sodding
12. Parking Lot
13. Playground
14. Shade Structures
15. Site Lighting
16. Prefabricated Restroom

### Bid Alternates:

- A. Alternate No. 1 – Embankment Slide
- B. Alternate No. 2 –Skate Area
- C. Alternate No. 3 – Area to Irrigated Bluegrass Seed (East Side of Park)
- D. Alternate No. 4- Area to Irrigated Native Seed (South Side of Park)
- E. Alternate No. 5- Area to Irrigated Native Seed (Northeast Corner of Park)
- F. Alternate No. 6- Area to Irrigated Bluegrass Sod (East Playfield)
- G. Alternate No. 7- 2' wide Addition to Existing Walk (Along Joplin Street)
- H. Alternate No. 8- 6' Wide Detached Walk With Irrigated Bluegrass Sod (Along 101st St.)

**Note:** A non-mandatory pre-bid conference and site visit will be held at Commerce City Recreation Center-6060 Parkway Dr. Commerce City, CO 80022 Conference Room A-B at 1:00 p.m M.S.T. on October 15, 2014. Questions pertaining to the drawings or specifications shall be submitted by email to the Owner's Representatives listed below and copied to the Owner, also below. The deadline for submitting questions in writing is 1:00 p.m. M.S.T. on October 22, 2014.

Owners Representative; Wember  
Paul Wember - [pwember@wemberinc.com](mailto:pwember@wemberinc.com)  
Conor Bancroft - [cbancroft@wemberinc.com](mailto:cbancroft@wemberinc.com)

Owner Project Manager; Commerce City Department of Parks, Recreation & Golf  
Tony Jaramillo, Project Manager – [tjaramillo@c3gov.com](mailto:tjaramillo@c3gov.com)

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### INVITATION TO BID

The City of Commerce City, Colorado (the “City”), is seeking sealed bids for **Fronterra Park** Bids shall be submitted to Tony Jaramillo, Project Manager, Department of Parks, Recreation & Golf, City of Commerce City, at the recreation center 6060 Parkway Dr. Commerce City, CO 80022 . Bids will be accepted until 1:00, p.m., M.S.T time, on October 30, 2014. There will be no formal bid opening. Bids will be evaluated by the City and bidders will be notified of results. Any Bid received after the time and date specified above shall not be considered.

A non-mandatory pre-bid conference will be held for this project on October 15, 2014 at 1:00 p.m M.S.T. at Commerce City Recreation Center 6060 Parkway Dr. Commerce City, CO 80022  
Plans and specifications are available at <http://www.rockymountainbidsystem.com/>. The Document Number is “ITB-TJ-CCRC-FP”

**Instruction to Bidders:** This project is funded through Commerce City’s \$137 million capital improvement program is the result of a November 2013 voter-approved sales and use tax increase that provides a dedicated revenue stream for new parks, recreation and road projects into the future.

Please see attached documents and include all required information along with the attached documents with your bid proposal:

- Construction Plans
- Contract Bid Documents

### REQUIREMENTS FOR SUBMISSION OF BIDS

Bids shall be submitted in a sealed envelope bearing on the outside the name of the company submitting the Bid (the “Bidder”), the Bidder’s office address and mailing address, the name of the Project and the date and time of opening of Bids. If forwarded by mail, a sealed envelope containing the Bid must be enclosed in another envelope properly addressed and postage or dispatching fee(s) prepaid.

All Bids must be submitted on the required Bid Form(s) supplied with the Contract Documents. All blank spaces for Bid prices must be filled in, in ink or typewritten, and the Bid Form(s) must be fully completed and executed. Only one (1) copy of the Bid Form(s) is required.

All Bids shall be valid from the date of Bid opening to the date of an executed Contract Agreement, or to a date not to exceed ninety (90) days after the date of the Bid opening, whichever is earlier.

If erasures or other changes appear in a Bid, each such erasure or change must be initialed by the person signing the Bid. Alternative Bids will not be considered. Telephone, email or faxed Bids will not be considered. Modification by telephone, email or fax of Bids already submitted will not be considered.

The Contract Documents contain the provisions for the construction of the Project. Information obtained from an officer, agent or employee of the City or any other person shall neither affect the risks or obligations assumed by the Bidder nor relieve it from fulfilling any of the Conditions of the Contract. A conditional or qualified Bid may be cause for rejection.

## **CITY OF COMMERCE CITY**

Each Bidder shall carefully examine the site(s) of the Work and fully acquaint itself with all conditions and matters that could in any way impact the Work or cost thereof. The Bidder shall become thoroughly familiar with the Specifications, Drawings and other Contract Documents before submitting a Bid. The failure or omission of any Bidder to do any of the foregoing acts shall in no way relieve it from any obligation in respect to its Bid or any provisions of the Contract Documents. Bidders must satisfy themselves as to the accuracy of the estimated quantities in the bid Schedule by examination of the site and a review of the Drawings and Specifications, including any Addenda. After Bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of work or of the nature of the Work to be done. Bidders shall be responsible for the accuracy of Bids.

The Bidder shall supply the names and addresses of major material suppliers and Subcontractors on the form provided.

Each Bid must be accompanied by Bid Security, i.e., Certified Check, Cashier's Check or Bid Bond, in the amount of not less than five percent (5%) of the amount of the Bid. The Bid Security shall be forfeited to the City as Liquidated Damages, not as a penalty, should the successful Bidder fail to enter into a contract in accordance with the Bid as specified in the Contract Agreement.

An Attorney-in-fact who signs Bid Bonds or Payment Bonds and Performance Bonds must file with each Bond a certified and effective dated copy of their power of attorney.

### **BID OPENING**

No responsibility shall be attached to any officer, clerk or other employee of the City for the premature opening of, or the failure to open, a Bid not properly addressed and/or identified.

There will be no formal public bid opening. Bids will be evaluated by the City and bidders will be notified of results.

In the event of an emergency situation (i.e., large snowstorm, tornado, etc.) that causes the City Manager to close City offices, the Project Manager is authorized to re-schedule the date for receiving Bids. All Bidders will be allowed to re-submit their Bids prior to the new date and time specified.

### **AWARD OF CONTRACT; NOTICE TO PROCEED**

The City may make such investigations as deemed necessary to determine the ability of Bidders to perform the Work, and Bidders shall furnish to the City all such information and data for this purpose as the City may request.

The City reserves the right to reject any and all Bids and to waive any and all irregularities and informalities if the City determines in its sole discretion that such rejection or waiver is in the best interests of the City. The City's decision to reject any or all Bids or to waive irregularities or informalities is final and without recourse by the Bidder.

Once Bids have been compared, the City shall return the Bid Bonds of all except the three lowest responsible Bidders. When the Contract is executed, the City shall return the Bid Bonds of the two remaining unsuccessful Bidders.

Award of a contract shall be made via the Notice of Award to a single Bidder (the "Successful Bidder") provided that the Bid is reasonable and it is in the best interests of the City to accept it.



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The Successful Bidder must furnish the Payment Bonds and the Performance Bonds on the forms provided, or on other substantially similar forms satisfactory to the City, attached to the appropriate sheet of the Contract Documents Performance and Payment Bonds, in the amount required, from a surety company holding a license from the State of Colorado to act as surety or from other Surety or sureties acceptable to the City. The Bid Bond of the Successful Bidder shall be retained until the Payment and Performance Bonds have been executed and approved, after which the Bid Bond will be returned.

The Successful Bidder shall furnish the Project Manager with a proposed schedule of construction within seven (7) calendar days after receipt of Notice of Award. The Notice to Proceed shall not be issued until the proposed schedule of construction is received and approved by the Project Manager.

The City will issue a Notice to Proceed within seven (7) calendar days of the execution of the Contract by the City. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time to issue the Notice to Proceed may be extended in writing by the City, but in no event shall the time to issue the Notice to Proceed be extended beyond an additional fifteen (15) days. If the Notice to Proceed has not been issued within the extended period, the Successful Bidder may terminate the Contract without further liability on the part of either party.

### **MISCELLANEOUS**

A party who has quoted prices to a Bidder is not thereby disqualified from quoting prices to others submitting bids or from submitting a Bid directly for the Work.

The Successful Bidder shall at all times maintain a maximum efficient working force to ensure completion of the Work within the time for completion set forth elsewhere in these Documents.

The City hereby notifies all Bidders that it does not discriminate in consideration of an Award of this Contract on the basis of race, creed, color, religion, gender or sex, age, handicap, veteran status, national origin or ancestry.

By submitting a Bid, Bidders agree to abide by the requirements found in Executive Order No. 11246, as amended, and in particular, the provisions regarding equal opportunity employment as set forth in the General Conditions.

All applicable laws, ordinances, permits, rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract and throughout the duration of the Contract, and by submitting a Bid, Bidders agree to abide by all such laws, ordinances, permits, rules and regulations.

The contact person with regard to this Project is Tony Jaramillo, Park Development Supervisor, City of Commerce City.

**BY AND FOR  
THE CITY OF COMMERCE CITY, COLORADO**

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By: Tony Jaramillo, Project Manager  
For: Carolyn J. Keith, CPRP, Director  
Department of Parks, Recreation & Golf

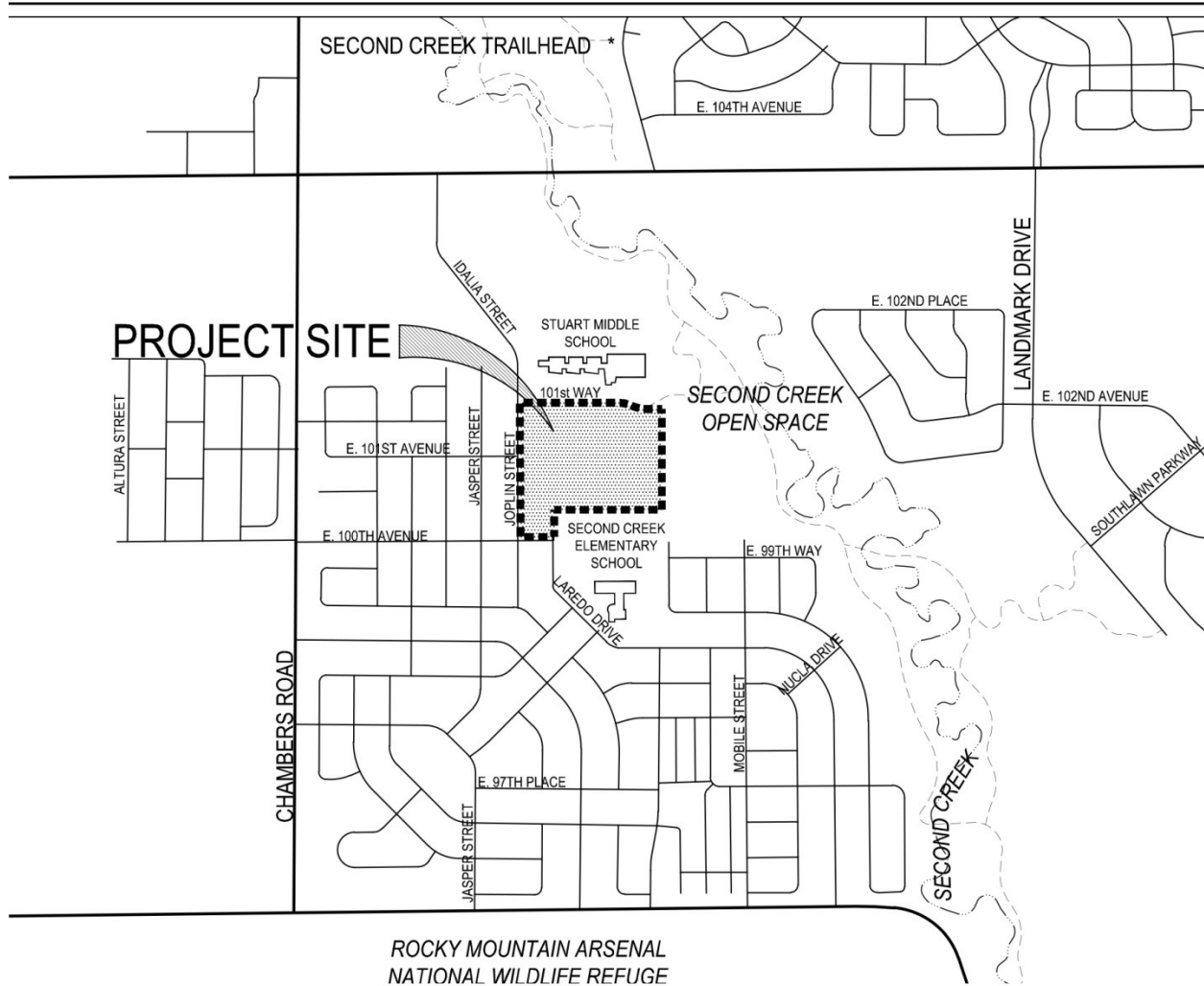
City of Commerce City  
6060 Parkway Avenue  
Commerce City, Colorado 80022  
Telephone: (303) 289-8166.

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**ATTENTION:** Due to past irregularities found in bid proposals, bids not completed precisely in accordance with the instructions found herein are subject to immediate rejection at the sole discretion of the City.

# CITY OF COMMERCE CITY

## Vicinity Map



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### **INSTRUCTIONS TO BIDDERS**

1. **CONTRACT DOCUMENTS.** When the words “Contract” or “Contract Documents” appear herein, they shall mean all of the following parts, together with all authorized modifications thereto:

- ADVERTISEMENT FOR BIDS
- INVITATION TO BID
- VICINITY MAP
- INSTRUCTIONS TO BIDDERS
- BID BOND
- CONTRACT PROPOSAL WITH BID FORM(S)
- LISTING OF NAMES AND ADDRESSES OF MAJOR MATERIAL SUPPLIERS AND SUBCONTRACTORS
- NOTICE OF AWARD
- INSURANCE AND WORKERS’ COMPENSATION CERTIFICATES
- PAYMENT AND PERFORMANCE BONDS
- CONTRACT AGREEMENT
- NOTICE TO PROCEED
- ACCEPTANCE OF NOTICE
- GENERAL CONDITIONS
- ADDENDA, IF ANY
- SCHEDULE(S) OF CONSTRUCTION
- DRAWINGS
- SPECIAL CONDITIONS (TECHNICAL SPECIFICATIONS)
- CHANGE ORDERS, IF ANY
- PLANS/SPECIFICATIONS

No less than all of the parts of the Contract Documents shall constitute the formal Contract.

2. **DEFINITIONS.** Technical and construction terms used in the Contract Documents shall have the meanings indicated, applicable to both the singular and plural thereof.

a) **ADDENDA:** Written or graphic instructions issued prior to the execution of the Agreement which modify or interpret the Contract Documents, by additions, deletions, clarification or corrections.

b) **AWARD:** The formal action of the City in accepting a Bid.

c) **BID:** The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

d) **BIDDER:** Any qualified person or entity submitting a proposal for the performance of the Work covered by the Plans/Specifications, Drawings, General and Special Conditions and Addenda (if any).

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- e) **BONDS**: Bid, Payment, and Performance, and other instruments of security, furnished by Contractor and its Surety in accordance with the Contract Documents.
- f) **CHANGE ORDER**: A written order to Contractor authorizing an addition, deletion or revision in the Work within the general scope of Contract Documents and/or authorizing an adjustment in the Contract Price or Contract time.
- g) **CITY**: The City of Commerce City, a Colorado home rule municipality located in the County of Adams whose principal business address is 7887 East 60<sup>th</sup> Avenue, Commerce City, CO 80022
- h) **CONTRACT DOCUMENTS**: All of the integral documents of the Contract, including all documents listed in Section 1 above and any other documents mutually and expressly agreed upon as Contract Documents by the Parties.
- i) **CONTRACT PRICE**: The total moneys payable to Contractor under the terms and conditions of the Contract Documents.
- j) **CONTRACT TIME**: The number of calendar days stated in the Contract Documents for the completion of the Work.
- k) **CONTRACTOR**: The individual or legal entity entering into the Contract with the City for the performance of Work covered by the Contract Documents.
- l) **DRAWINGS**: The part of the Contract Documents that show the characteristics and scope of the Work to be performed and that have been prepared or approved by the Project Manager. (Also called Plans).
- m) **PROJECT MANAGER**: The Parks Planning and Operations Manager, the Parks Development Supervisor, or other authorized representative(s) acting on behalf of the City.
- n) **FIELD ORDER**: A written order issued by the Project Manager to Contractor during construction that creates a change in the Work not involving an adjustment in the Contract Time or Price.
- o) **GENERAL CONDITIONS**: A part of the Contract Documents consisting of terms and conditions governing the technical nature of materials, equipment, construction systems, standards and workmanship, the administration of the Contract and certain rights and responsibilities of the Parties.
- p) **NOTICE OF AWARD**: The written notice to the Successful Bidder of the City's acceptance of the Bid.
- q) **NOTICE TO PROCEED**: Written communication issued by the City to Contractor authorizing it to commence the Work.
- r) **PARTIES**: The parties to the Contract; specifically, the City and Contractor.
- s) **PROJECT**: The undertaking to be performed as provided in the Contract Documents.

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t) OWNER'S REPRESENTATIVE: The authorized representative of the City who is assigned to the Project.

u) SHOP DRAWINGS: All drawings, diagrams, illustrations, brochures, schedules and other data that are prepared by Contractor or a Subcontractor, Manufacturer, Supplier or Distributor that illustrate how specific portions of the Work shall be fabricated or installed.

v) SPECIAL CONDITIONS: Specific conditions, requirements, additions and/or revisions to the standard Drawings/Plans and/or specifications applicable to the Work to cover conditions or requirements peculiar to the Project.

w) SUBCONTRACTOR: An individual or legal entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

x) SUBSTANTIAL COMPLETION: When the construction of the Project or a specified part thereof is sufficiently completed in accordance with the Contract Documents, as certified by the Project Manager, so that the Project or a specified part thereof can be used for the purposes intended.

y) SURETY: The entity that has guaranteed a bond or other security on behalf of Contractor for the performance of the Work hereunder.

z) WORDS OF IMPORTANCE: When the Plans/Specifications state the work "as directed," "as required" or words of like meaning are used, it shall be understood that the direction, requirement or permission of the Project Manager is intended. Similarly, the words "approved," "acceptable" and "satisfactory" shall refer to approval by the Project Manager.

aa) WORK: All labor necessary to produce the construction required by the Contract Documents and all materials and equipment incorporated or to be incorporated in the Project.

bb) WRITTEN NOTICE: Any notice relative to any part of this Agreement, in writing, and considered delivered and the service thereof completed when posted by certified or registered mail to the party at its last given address or delivered in person to said party or its authorized representative on the Work.

3. BIDS. In filling out the Bid Form, Bidders shall be governed by the following:

a) Bids shall be made upon the Bid Form provided in the Contract Documents. Unit prices and extensions shall be entered in the spaces provided on the Bid Form on the line pertaining to each Bid item. Total Bid amount shall be both written in words and expressed in numbers. If a discrepancy exists between the amount stated in words and the amount stated in figures, the amount stated in words shall govern. In case of an error in the extension of the price, the unit Bid Price shall govern. Prices and name of signatory shall be printed in ink or by typewriter; all signature(s) shall be in ink.

b) The unit price items in the Contract Bid Form 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. The cost of appurtenant items of work, materials and equipment not listed separately, not shown on the Drawings or not specified but necessary to complete the Work in accordance with the Contract Documents shall be considered as included in the unit price Bid.

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c) Bids shall be made on each separate item of work shown in the Bid, with reasonable relation to the probable cost of doing the work included in such item, and the right is reserved to reject any Bid in case an item or items thereof are obviously unbalanced or appear to be so unbalanced as to affect adversely an interest of the City.

d) The quantities listed in the Bid are approximate and are given only for use in comparing Bids and to indicate approximately the total amount of the Contract. The City does not expressly or by implication represent that the actual amounts of Work will correspond therewith, but does call particular attention to the uncertainty in the quantities of the Work involved, which cannot be predicted in advance. The Work under certain items may be materially greater or less than those given in the Bid as may be necessary in the judgment of the Project Manager to complete the Work contemplated in the Contract.

e) Each Bidder is required to state in its Bid its full name, legal office address and mailing address (if different) and shall state the names of all persons interested with it in the Bid, and if no other person be so interested, the Bidder shall distinctly state the fact. It is further understood that the Bid is made without connection with any other individual or legal entity submitting a Bid for the Work and that the Bid is in all respects fair and made without collusion or fraud.

f) A Bid may be disregarded by the City if any modification of the Contract Documents, as prepared by the City, is made by the Bidder or if the Bidder fails to fully complete and fill in all blanks necessary to complete the Contract Documents.

g) A Bid Bond or certified or cashier's check, as described in the Invitation for Bid must accompany each Bid.

h) Each Bidder must examine and will be held to have examined the site of the Work and satisfied itself as to the conditions under which it will be obligated to perform the Work. The Project Manager's estimate of quantities given in any preliminary statement of work is to be considered as approximate only, and Contractor shall not, at any time, make claim to any additional payment(s) or consideration on account of any misunderstanding regarding the nature or amount of the work to be performed.

i) If the City is not satisfied as to the ability of the Bidder to perform the Work set forth herein, or the suitability of its equipment, the City may at its sole discretion require a statement of competency, which shall include:

- (1) Work performed by Contractor in the last five years;
- (2) Plant and equipment, described in detail, available and that it now proposes to use on this Work;
- (3) Recent financial statement relative to resources, including cash and bank credits available;
- (4) Name of surety company that has indicated its willingness to bond the Bidder;
- (5) Statement of material on hand and available for this Work; and

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(6) Qualifications of the supervisors who will supervise the various trades at the job site.

(7) The Bidder otherwise qualified may be required, either before or after the Bid Opening, to demonstrate availability of equipment and organization, not otherwise committed, to perform the Work within the time limit specified in the Contract Documents. Bidders shall be required to fully inform the Project Manager of their availability for prompt performance of this Contract.

j) Bids must be sealed and addressed to and deposited with the City at the location stated in the Invitation to Bid before the hour set for opening of Bids in the Invitation to Bid. The envelope enclosing the Bid must show the official Project Name and City Project Number of the Work, name of company of the Bidder and date and time for Bid Opening.

4. **WITHDRAWAL OF BID.** A Bidder may withdraw its Proposal, at any time prior to the expiration of the period during which bids may be submitted, by notarized written request signed in the same manner and by the same person who signed the Proposal.

5. **INTERPRETATION OF PLANS/DRAWINGS, SPECIFICATIONS AND DOCUMENTS.** Should a Bidder find discrepancies in, or omissions from, the Drawings/Plans, Specifications or any other Contract Document, or should the Bidder be in doubt as to the meaning thereof, it shall notify the Project Manager in writing at least seven (7) calendar days prior to the time set for the opening of Bids. Phone calls to the City are not acceptable. If the point in question is not clear, the City will issue a written Addendum. Each Bidder requesting an interpretation will be responsible for the delivery of its request to the Project Manager. The City will not be bound by or be responsible for any explanations or interpretations of the Documents other than those given in writing as set forth in this Section.

6. **SUBSTITUTION FOR PATENTED AND SPECIFIED ARTICLES.** The materials, products, equipment or processes described in the Contract Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. The materials, products, equipment or process specified shall be considered as the basis for the bid. Substitutions shall not be considered unless a written request has been submitted by the Bidder and has been received and approved by the Project Manager at least ten (10) calendar days prior to the date for receipt of Bids. Each request shall include the name of the item for which it is to be substituted and a complete description of the proposed substitute. The description shall include trade names, drawings, specifications, cuts, performance and test data and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or Work that incorporation of the substitute would require shall be included. The burden of proof concerning the merit of the proposed substitute is upon the Bidder. The Project Manager's decision of approval or disapproval of a proposed substitute shall be final. If the Project Manager approves any substitutions, the approval shall be authorized by an Addendum. Bidders shall not rely upon approvals made in any other manner.

7. **AWARD OR REJECTION OF BIDS.**

a) Bids will be compared among all Bids that are received for the basic (base) Bid Price to cause a first determination as to which Bidder is the lowest and best Bidder for the Project.

b) The Contract will be awarded to the lowest responsible Bidder complying with these instructions and with the Invitation to Bid, provided that the Bid is in the best interest of the



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City. The City shall be the sole judge of the Bidder's qualifications and whether the Bid is in the City's best interest. The City reserves the right to accept or reject any or all Contract Proposals in whole or in part.

8. **STATE AND FEDERAL LAWS.** Bidders shall familiarize themselves with the laws of the State of Colorado, the Federal Government and the City and all regulations made pursuant to any of them pertaining to the proposed Work and shall comply with the same.

9. **CONSIDERATION OF CONTRACT PROPOSAL.** The Bid Securities, other than that of the successful Bidder, will be returned once the Contract Agreement and the Performance and Payment Bonds have been executed and approved. The successful Bidder shall execute the Contract Agreement and furnish the Performance and Payment Bonds and insurance required within seven (7) calendar days from the date of the Notice of Award or such other date mutually agreed in writing by the Parties. The successful Bidder's failure to comply with this provision shall constitute just cause for annulling the Award, and in such event, the avails of the Bid Security of the Bidder shall become the property of the City. The Award may then be made to another Bidder, the City may call for other Bids or the City may elect to forego the Project.

10. **LIMIT OF ONE BID.** No individual or entity shall make or file more than one Bid for the same Work unless alternate bids are required.

11. **SUBLETTING.** No part of the Contract shall be sublet or assigned without the written approval of the Project Manager. The Bidder shall not propose to use subcontractors for more than 50% of the Work without prior written approval of the Project Manager.

12. **SCHEDULE OF CONSTRUCTION AND ESTIMATED PAYMENTS.** The Bidder to whom the Contract is awarded must furnish to the City, within seven (7) calendar days after receipt of the Notice of Award, a proposed schedule of construction. The Notice to Proceed will not be issued until the proposed schedule of construction is received and approved by the Project Manager.

13. **SALES AND USE TAX.** Unless specifically exempt, all construction within the City is taxable, including construction performed on behalf of an exempt institution or governmental, religious, charitable, private or any other type of owner, including the City.

a) The Successful Bidder shall be subject to the tax on all purchases, fabrication, manufacture or other production of tangible personal property used, stored or consumed on the Project. This includes construction of parking lots, roads, bridges, highways and buildings and remodeling of both public and private facilities.

b) 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.

c) Prior to or on the date the Contractor locates equipment within the City to fulfill the contract, the Contractor shall file a declaration describing each anticipated piece of equipment the purchase price of which was two thousand five hundred dollars (\$2,500.00) 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

## **CITY OF COMMERCE CITY**

price of such equipment in the contract amount, in compliance with Section 20-5-V of the Commerce City Sales and 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.

**CITY OF COMMERCE CITY**

**BID BOND**

Know all men by these presents, that \_\_\_\_\_ as principal, and, \_\_\_\_\_ as Surety, are held and firmly bound unto the City of Commerce City, Colorado (hereinafter called "City"), in the penal sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_), lawful money of the United States of America, for the payment of which sum will and truly to be made, we bind ourselves, our heirs, severally, firmly by these present.

The condition of this obligation is such that whereas, the principal has submitted the accompanying Bid dated \_\_\_\_\_ for \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

set out in the accompanying Bid; and

Whereas, the City has required as a condition for receiving said Bid that the principal deposit with the City either a certified or cashier's check equal to five percent (5%) of the amount of the Bid, or in lieu thereof, furnish a Bid Bond for said amount. Conditioned that in the event of failure to execute the proposed Contract for such construction and the required Payment and Performance Bonds, if the Contract be awarded it, that said sum be paid immediately to the City as Liquidated Damages, not as a penalty, for the principal's failure to perform.

Now therefore, if the principal shall, within the period specified in the Instructions to Bidders,

- A) On the attached prescribed forms presented to it for signature, enter into a written contract with the City in accordance with its bid as accepted, and give Payment and Performance Bonds with good and sufficient surety, or securities, as may be required upon the forms prescribed by the City, for the faithful performance and the proper fulfillment of the Contract, or
- B) Withdraw said bid within the time specified in the Instructions to Bidders or have such bid rejected by the City, or
- C) Pay to the City the sum of this Bond as Liquidated Damages, and not as a penalty,

then this obligation shall be void and of no effect, otherwise to remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and this Bond shall be in no way impaired or affected by any extension of time within which the City may accept the Bid, and Surety does hereby waive notice of any such extension.

**CITY OF COMMERCE CITY**

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Principal

Attest:

By: \_\_\_\_\_

\_\_\_\_\_  
Surety: \_\_\_\_\_

Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

By: \_\_\_\_\_

Attorney-in-fact

Local Agent \_\_\_\_\_

Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CITY OF COMMERCE CITY**

**CONTRACT PROPOSAL WITH BID FORM(S)**

Project No. PRG-03-2014

Date: \_\_\_\_\_

City Manager  
City of Commerce City, Colorado  
7887 East 60th Avenue  
Commerce City, Colorado 80022

The undersigned Bidder, having examined the site of the proposed Work and having full knowledge of the conditions under which the Work must be performed, hereby proposes to enter into and perform the Contract Agreement that is set forth in the Contract Documents, of which this Bid forms a part, and perform the construction therein described on the terms and conditions therein set forth, furnish all required labor and materials and pay all incidental costs, all in strict conformity with the Contract Documents, for the following unit prices listed in Bid Form(s) as payment in full.

The following surety company has indicated its willingness to bond our firm for the Work herein described.

\_\_\_\_\_  
Name of Surety

\_\_\_\_\_  
Attorney-In-Fact, Surety

If awarded the Contract, the undersigned hereby agrees to execute said Contract Agreement and furnish the required Performance Bond and Payment Bond and procure the required insurance within seven (7) calendar days from the date of the Notice of Award of the Contract or such other date as otherwise mutually agreed upon in writing by the Parties.

The undersigned further proposes that should this Proposal be accepted, it will commence work within seven (7) calendar days from the date of the Notice to Proceed and complete all the Work covered by the Contract Documents within 200 calendar days from the date of the Notice to Proceed.

The undersigned further agrees, if awarded the Contract for the Work included in this Bid Proposal, to begin and to complete and deliver the Work contemplated in accordance with the conditions set forth in the Contract Documents. The undersigned has checked carefully the figures inserted hereinafter and understands that the City will not be responsible for any error or omissions on the part of the undersigned in preparing this bid.

The undersigned hereby certifies that this Bid is genuine, and not sham or collusive or made in the interest or behalf of any person not herein named and that the undersigned has not, directly or indirectly, induced or solicited any other Bidder to put a sham bid, or induced any other person, firm or corporation to refrain from bidding, and that the undersigned has not in any manner sought by collusion to secure for itself any advantages over any other Bidder.

The only persons interested as principals in this Bid other than the one whose signature is affixed hereto are to be listed as follows (if there are none, state such fact): \_\_\_\_\_.

Name: \_\_\_\_\_ Address \_\_\_\_\_

Name: \_\_\_\_\_ Address \_\_\_\_\_

This Bid shall be valid from the date of opening to the date of an executed Contract Agreement, or to a date not to exceed ninety (90) calendar days after the date of bid opening, whichever is earlier.

## CITY OF COMMERCE CITY

The undersigned Bidder submits herewith Bid Security in the form of a Bid Bond, Certified or Cashier's Check in favor of the City of Commerce City, Colorado, in the amount of not less than five percent (5%) of the total Bid in dollars, and agrees and consents that the Bid Security shall be forfeited to the City of Commerce City, Colorado, as Liquidated Damages, not a penalty, if the required Payment and Performance Bonds are not executed within seven (7) calendar days from the Notice of Award, or date otherwise mutually agreed upon in writing by the Parties.

In submitting this Bid, it is understood that the right is reserved by the City to reject any or all bids and to waive irregularities and informalities in bidding.

Respectfully submitted,

\_\_\_\_\_  
Contractor (Bidder) (SEAL)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name & Title

a/an corporation/limited liability company/partnership/individual organized under the laws of the State of \_\_\_\_\_ composed of the following members, managing members, officers, partners or owners:

\_\_\_\_\_  
President/CEO/COO of Corporation or  
Manager/Managing Member of LLC or  
Managing Partner of Partnership

\_\_\_\_\_  
Vice President/CFO/Managing Member/Member/Partner

\_\_\_\_\_  
Secretary/Managing Member/Member/Partner

\_\_\_\_\_  
Name of Contractor

\_\_\_\_\_  
Treasurer/Managing Member/Member/Partner

\_\_\_\_\_  
Address

\_\_\_\_\_  
City State Zip Code

( ) \_\_\_\_\_  
Telephone Number

**Note:** Contractor, also complete Pages \_\_\_\_\_, which follow this page.

# CITY OF COMMERCE CITY

## **BID FORM**

Title: Fronterra Park

Submit bids for all items; failure to do so will render bid non-responsive. If no bid item exists for a portion of the work, include the costs in the related bid item.

## **BASE BID**

Bid Item No.	Base Bid Price Item	Quantity	Unit	Unit Price	Total Price (in figures)
1.	Mobilization/ General Conditions	1	LS	Lump Sum	
2.	Erosion Control	1	LS	Lump Sum	
3.	Construction Surveying	1	LS	Lump Sum	
4.	Site Demolition	1	LS	Lump Sum	
5.	Clearing and Grubbing	1	LS	Lump Sum	
6.	Site Grading	1	LS	Lump Sum	
7.	Concrete Paving	52,725	SF		
8.	Concrete Paving- Colored	205	SF		
9.	Playground Ramp	1	EA		
10.	Pedestrian Ramps	3	EA		
11.	Multi-Use Sport Court	1	LS	Lump Sum	
12.	Parking Lot	1	LS	Lump Sum	
13.	Concrete Thickened Edge- Playground	355	LF		

**CITY OF COMMERCE CITY**

Bid Item No.	Base Bid Price Item	Quantity	Unit	Unit Price	Total Price (in figures)
<b>14.</b>	Concrete Edging at Landscape	625	LF		
<b>15.</b>	Crusher Fines Path	3090	SF		
<b>16.</b>	Storm Drainage	1	LS	Lump Sum	
<b>17.</b>	Irrigation System	1	LS	Lump Sum	
<b>18.</b>	Terraced Seatwalls w/ Stone Slab Steps	1	LS	Lump Sum	
<b>19.</b>	Playground Boulders	4	EA		
<b>20.</b>	Sandblasted Boulders	6	EA		
<b>21.</b>	Landscape Boulders	29	EA		
<b>22.</b>	Sandstone Distance Markers	9	EA		
<b>23.</b>	Large Shade Shelter	1	EA		
<b>24.</b>	Small Shade Shelter	1	EA		
<b>25.</b>	Picnic Tables	11	EA		
<b>26.</b>	Trash Receptacles	8	EA		
<b>27.</b>	6' Bench-"A"	3	EA		
<b>28.</b>	6' Bench-"B"	6	EA		
<b>29.</b>	Grill	2	EA		
<b>30.</b>	Bike Racks	2	EA		



**CITY OF COMMERCE CITY**

Bid Item No.	Base Bid Price Item	Quantity	Unit	Unit Price	Total Price (in figures)
<b>31.</b>	Restroom Building including utility connections	1	LS	Lump Sum	
<b>32.</b>	Landscaping	1	LS	Lump Sum	
<b>33.</b>	Playground Play Equipment	1	LS	Lump Sum	
<b>34.</b>	Fibar Surface-Playground	1	LS	Lump Sum	
<b>35.</b>	Pedestrian Lighting/ Electrical	1	LS	Lump Sum	
<b>36.</b>	Non- Irrigated Native Seeding	178,343	SF		
<b>37.</b>	Irrigated Native Seeding	167,400	SF		
<b>38.</b>	Irrigated Bluegrass Seeding	130,040	SF		
<b>39.</b>	Bluegrass Sod	262,543	SF		
	<b>TOTAL BASE BID PRICE IN FIGURES</b> (Bid items 1 –39)	-----	-----	----- ----	

**TOTAL BASE BID (Bid items 1-39) IN WORDS:**

\_\_\_\_\_

**DOLLARS AND CENTS.**

# CITY OF COMMERCE CITY

## **BID ALTERNATES**

Note: The alternates are listed in order of priority.

Bid Item No.	Bid Alternate Price Item	Quantity	Unit	Unit Price	Total Price (in figures)
1.	Embankment Slide	1	LS	Lump Sum	ADD_____
2.	Skate Area	1	LS	Lump Sum	ADD_____
3.	Area of Irrigated Bluegrass Seed (East side of park)	61,540	SF		ADD_____
4.	Area of Irrigated Native Seed (South side of park)	61,570	SF		ADD_____
5.	Area of Irrigated Native Seed (Northeast corner of park)	51,220	SF		ADD_____
6.	Area of Irrigated Bluegrass Sod (East playfield)	125,440	SF		ADD_____
7.	2' Wide Addition to Existing Walk (Along Joplin St.)	1,800	SF		ADD_____
8.	6' Wide Detached Walk With Irrigated Bluegrass Sod (Along 101 <sup>st</sup> . Street)	1	LS	Lump Sum	ADD_____
	TOTAL ALL BID ALTERNATES (Items 1-8)	-----	-----	-----	

**CITY OF COMMERCE CITY**

**UNIT PRICES**

<b><u>ITEM</u></b>	<b><u>Unit</u></b>	<b><u>Unit Price</u></b>
Sod including amendments & fine grading	SF	_____
Seeding including amendments & fine grading	SF	_____
Concrete Paving 6" thick	SF	_____
Roll Top Edging	LF	_____
Concrete Edger	LF	_____

A. Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage for increases and credits will be:

1. \_\_\_\_\_ percent overhead and profit on the net cost of our own Work;
2. \_\_\_\_\_ percent on the cost of work done by any Subcontractor.
3. \_\_\_\_\_ percent bonding
4. \_\_\_\_\_ percent labor burden

I acknowledge that this bid includes addendum #\_\_\_\_, #\_\_\_\_, #\_\_\_\_. If none, so state.

Signed: \_\_\_\_\_

Name Printed: \_\_\_\_\_

Title: \_\_\_\_\_

Company: \_\_\_\_\_

## CITY OF COMMERCE CITY

## GENERAL INFORMATION

Check One:    ☐ Corporation   ☐ Partnership   ☐ Joint Venture  
                  ☐ Individual   ☐ Other \_\_\_\_\_

1. How many years has your organization been in business as a General Contractor under the present company's name? \_\_\_\_\_
2. How many years has your company been in business under its present business name? \_\_\_\_\_
3. If a Corporation, answer the following:

Date of Incorporation: \_\_\_\_\_  
 State of Incorporation: \_\_\_\_\_  
 President: \_\_\_\_\_  
 Vice-President(s): \_\_\_\_\_  
 Secretary: \_\_\_\_\_  
 Treasurer: \_\_\_\_\_

4. If a Partnership, answer the following:

Date of Organization: \_\_\_\_\_  
Type of Partnership: \_\_\_\_\_  
(General/Limited/Assoc)

Name and Address  
Of all Partners

6. Is the Contractor authorized to transact business in Colorado? \_\_\_\_\_  
(If the answer is "no", skip items 7, 8, & 9.)

7. Is the Contractor's principal place of business in Colorado? \_\_\_\_\_  
(If the answer is "no", you must answer item 8; if the answer to 7 is "yes", disregard questions 8 & 9 below.)

8. a. Does the Contractor maintain a place of business in Colorado?  
(If the answer is "yes", you must answer question 8. b.)

b. Has the Contractor paid Colorado Unemployment Compensation Taxes in at least 75% of the 8 quarters immediately prior to the date of bid? \_\_\_\_\_  
(If the answer to either 7 and 8a. and/or 7 and 8b. is "no", the Contractor is a nonresident of Colorado, and must respond to item 9 below.)

9. As a nonresident Contractor, you must describe below any preference given to the residents of the state or foreign country of your organization's residence (principal place of business) over nonresident contractors. It is your obligation as a Contractor for this Project to inform yourself as

**CITY OF COMMERCE CITY**

to the existence of any such preferences and to disclose the same below (C.R.S. 8-19-101, et seq.).

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10. List states and categories in which your organization is legally qualified to do business?

State:_____	Category:_____
State:_____	Category:_____
State:_____	Category:_____
State:_____	Category:_____
State:_____	Category:_____
State:_____	Category:_____

**GENERAL PERFORMANCE HISTORY**

11. Have you ever failed to complete any work awarded to you? If so, indicate when, where, and why.

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12. Have you ever defaulted on a contract? If so, when, where, and why?

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13. Has any Officer or Partner of your organization ever been an Officer or Partner of another organization that failed to complete a construction contract? If so, state circumstances:

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**CITY OF COMMERCE CITY**

14. Have you ever failed to be awarded a contract on which your organization was low bidder? If so, when, where, and why?

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15. Are any lawsuits pending against you, your company, or the officers of the company at this time? \_\_\_\_\_ If "yes", detail:

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16. Were you ever suspended, debarred, or determined to be ineligible from entering into contracts with any Federal, State, or local governmental entity: \_\_\_\_\_  
If "yes", detail:

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17. Provide the company's OSHA reportable accident rate and current workmen's compensation insurance multiplier for the last 3 years. Provide the OSHA reportable accident rate on projects managed by the proposed superintendent or project manager over the 3-year period (depending on who is assigned site safety responsibility in the Contractor organization).

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## CITY OF COMMERCE CITY

### 2.1 QUALIFICATIONS FORM

1. List the years of construction experience of the principal individuals in your organization as well as the key individual that will be assigned to this project including the percentage of their time to be assigned to this project. List recent similar projects for the proposed project manager and superintendent. Key project staff will be contractually tied to the Project and Contractor shall attain written approval from the Project Manager prior to changing proposed Project Manager and/or Superintendent.

Name	Position	Years of Experienced	Percent of Time

2. What percent of construction work does company self-perform with your own forces?

Trades	%	Trades	%

3. List comparable construction projects your company has under contract on this date:

- A. Project Name: \_\_\_\_\_  
Owner: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Architect/Engineer: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_ Contract Date: \_\_\_\_\_  
Percent Complete: \_\_\_\_\_ Scheduled Completion: \_\_\_\_\_  
Project Manager: \_\_\_\_\_ Project Superintendent: \_\_\_\_\_
- B. Project Name: \_\_\_\_\_  
Owner: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Architect/Engineer: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_ Contract Date: \_\_\_\_\_  
Percent Complete: \_\_\_\_\_ Scheduled Completion: \_\_\_\_\_  
Project Manager: \_\_\_\_\_ Project Superintendent: \_\_\_\_\_
- C. Project Name: \_\_\_\_\_  
Owner: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Architect/Engineer: \_\_\_\_\_ Phone Number: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_ Contract Date: \_\_\_\_\_  
Percent Complete: \_\_\_\_\_ Scheduled Completion: \_\_\_\_\_  
Project Manager: \_\_\_\_\_ Project Superintendent: \_\_\_\_\_

**CITY OF COMMERCE CITY**

I acknowledge that this bid includes addendum #\_\_\_\_, through #\_\_\_\_. If none, so state.

Signed: \_\_\_\_\_

Name Printed: \_\_\_\_\_

Title:\_\_\_\_\_

Company:\_\_\_\_\_

Address:\_\_\_\_\_

E-mail:\_\_\_\_\_

Phone:\_\_\_\_\_



**CITY OF COMMERCE CITY**

**LISTING OF NAMES AND ADDRESSES OF MAJOR MATERIAL SUPPLIERS AND  
SUBCONTRACTORS**

**PROPOSED SUBCONTRACTORS/SUPPLIERS**

The following information is submitted for each subcontractor that will be used in the work if the Bidder is awarded the Agreement. Additional numbered pages shall be attached to this page as required. Each page shall be signed. All work to be subcontracted over **\$10,000** shall be listed.

<u>Amount of Subcontract</u>	<u>Name and Address of Subcontractor</u>	<u>Portion of Work</u>
_____	_____	_____
_____	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

This is to certify that the names of the foregoing mentioned Subcontractors or material suppliers are submitted with full knowledge and consent of the respective parties

Bidders: \_\_\_\_\_  
(Name of Company)

By: \_\_\_\_\_  
(Signature and Title)

Date: \_\_\_\_\_

**CITY OF COMMERCE CITY**

**NOTICE OF AWARD**

To: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Project Name: FRONTERRA PARK

Project Number: PRG-03-2014

The City of Commerce City (the "City") has considered the Bid submitted by you for the above-described Work in response to the City's Advertisement for Bids. You are hereby notified that your Bid has been accepted in the amount of \_\_\_\_\_.  
(\$\_\_\_\_\_). [This Notice of Award includes addenda #\_\_\_\_\_, #\_\_\_\_\_.]

You are required by the Instructions to Bidders to execute the Contract Agreement and furnish the required Contractor's Payment and Performance Bonds (the "Bonds") and Certificates of Insurance within seven (7) calendar days from the date of this Notice of Award to you, or such other date mutually agreed upon in writing by you and the City.

Within seven (7) calendar days after receipt of this Notice of Award, you shall furnish to the Project Manager a proposed schedule of construction. A Notice to Proceed will not be issued until the proposed schedule of construction is received and approved by the Project Manager.

If you fail to execute the Contract Agreement and furnish the Bonds as required above, the City will be entitled to consider all your rights arising out of the City's acceptance of your bid as being abandoned and as a forfeiture of your Bid Security. The City will be entitled to such other rights as may be available at law or equity.

You must return an acknowledged copy of this Notice of Award to the City.

The bid Security submitted with your Proposal will be returned upon your execution of the Contract Agreement and the furnishing of the Bonds. In the event you fail to execute the Contract Agreement or furnish the Bonds within the time limit specified, the Bid Security shall be retained by the City as Liquidated Damages, not a penalty, for failure to accept the Award and execute the necessary Documents for the formation of the Contract.

The City of Commerce City certifies that an adequate appropriation of funds is available to equal the contract amount, as bid.

Please be advised that the executed Contract Agreement is not binding until signed by the City of Commerce City. You should not make any expenditures in anticipation of this Work except for items

**CITY OF COMMERCE CITY**

pertaining to the signing of the Contract Agreement and appurtenant forms until you receive the Notice to Proceed.

Dated this \_\_\_\_\_, day of \_\_\_\_\_ 20\_\_.

CITY OF COMMERCE CITY, COLORADO

\_\_\_\_\_  
Title: \_\_\_\_\_

**ACCEPTANCE OF NOTICE**

Receipt of the above Notice of Award is hereby acknowledged by \_\_\_\_\_  
this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By: \_\_\_\_\_ Title: \_\_\_\_\_

**CITY OF COMMERCE CITY**

**INSURANCE**  
**AND**  
**WORKERS' COMPENSATION**  
**CERTIFICATES**

Copies or originals are acceptable

(Attach certificates for insurance coverage as required by the General Conditions.)

**CITY OF COMMERCE CITY**

**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.

EXECUTED on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

Attest:

\_\_\_\_\_  
(Contractor)

By: \_\_\_\_\_

\_\_\_\_\_  
(President)

\_\_\_\_\_  
(Surety Company)

By: \_\_\_\_\_  
(Attorney-in-Fact)

## CITY OF COMMERCE CITY

### 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 sufficient funds to pay the cost of completion including all costs and damages for which the Surety may be liable hereunder, but not exceeding the amount set forth in the first paragraph hereof, 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.

**CITY OF COMMERCE CITY**

EXECUTED on this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

Attest:

\_\_\_\_\_

\_\_\_\_\_  
Contractor

By: \_\_\_\_\_  
President/CEO/Managing Member/Managing Partner

\_\_\_\_\_  
(Surety Company)

By: \_\_\_\_\_  
(Attorney-in-Fact)

## CITY OF COMMERCE CITY

### AGREEMENT FOR CONSTRUCTION CONTRACT

THIS AGREEMENT FOR CONSTRUCTION CONTRACT (the "Contract") is made and entered into effective this \_\_\_\_ day of \_\_\_\_\_, 2014 (the "Effective Date"), by and between the CITY OF COMMERCE CITY, a Colorado home rule municipality whose address is 7887 East 60<sup>th</sup> Avenue, Commerce City, CO 80022 (the "City"), and \_\_\_\_\_ whose principal business address is \_\_\_\_\_, ("Contractor").

NOW, THEREFORE, in consideration of the mutual covenants and agreements contained herein, the parties agree as follows:

1. PROJECT – SCOPE OF WORK. Contractor shall commence and complete the \_\_\_\_\_, Project Number \_\_\_\_\_ (the "Project"), in accordance with the Contract Documents, and shall execute the entire scope of Work set forth in the Contract Documents.
2. CHANGED CONDITIONS. Contractor specifically waives any claim for additional compensation for any changed condition, unless such changed condition is caused in whole or in part by acts or omissions within the control of the City or persons acting on behalf thereof, arising out of any of the following:
  - a. A physical condition of the site of an unusual nature;
  - b. Differing materially from those ordinarily encountered and generally recognized as inherent in work of the character and at the location provided for in the Contract Documents; or
  - c. As a result of any force majeure.
3. PROSECUTION OF THE WORK. Contractor shall, at its own expense, do all Work in a professional and workmanlike manner and furnish all labor, materials, tools, supplies, machinery, utilities and other equipment that may be necessary for the completion of the Project, as outlined in the Plans/Drawings, Specifications, General and Special Conditions and the Contract Documents.
4. RATE OF PROGRESS. Contractor acknowledges and understands that it is an essential term of this Contract that Contractor maintain a rate of progress in the Work that will result in completion of the Project in accordance with the Contract Documents, and to that end, Contractor agrees to proceed with all due diligence to complete the Work in a timely manner in accordance with the Contract Documents.
5. COMMENCEMENT AND COMPLETION OF THE WORK. Contractor understands and agrees that the Work shall be commenced within ten (10) calendar days from and including the date of the Notice to Proceed, and Contractor shall have all work required under this Contract fully completed, as set forth in the Contract Documents, by \_\_\_\_\_ (date).



## CITY OF COMMERCE CITY

6. CONTRACT PRICE. Contractor agrees to perform the Work described in the Contract Documents and to comply with the terms therein for the sum of \_\_\_\_\_ (\$ \_\_\_\_\_) (the "Contract Price"), subject to Change Orders executed in accordance with the Contract Documents. The City shall make payment(s) to Contractor in the manner and at such times as set forth in the General Conditions such amounts as are required by the Contract Documents. The Contract Price is provisional based on the quantities contained in the Contract Documents attached hereto.
7. CONTRACT DOCUMENTS; PRIORITY. The term "Contract Documents" includes the following, each and all of which are a part thereof and have the same force and effect as if spread at length herein. In resolving inconsistencies among two or more of the Contract Documents, precedence will be given in the same order as enumerated here.
- a. Change Orders;
  - b. Notice to Proceed;
  - c. Agreement for Construction Contract;
  - d. The following Addenda, if any:  
**Number    Date    Pages**
  - e. Special Conditions of the Contract:  
**Document   Title   Pages**
  - f. Agreement for Construction Contract;
  - g. General Conditions;
  - h. The following Specifications;  
**Section    Title**
  - i. The following Drawings:  
**Number    Title    Date**
  - j. Notice of Award;
  - k. Invitation to Bid;
  - l. Information and Instructions to Bidders;
  - m. Notice of Substantial Completion;
  - n. Notice of Construction Completion;
  - o. Proposal Forms, including Bid Schedules;
  - p. Performance, and Labor and Material Payment Bonds;
  - q. Performance Guarantee; and
  - r. Insurance Certificates and Endorsements.
8. APPROPRIATION. The City confirms that the amount of money appropriated for this Contract is equal to or in excess of the contracted amount, and it is agreed that no Change Order, or other form of order or directive by the City requiring additional compensable work to be performed or that causes the aggregate amount payable under this Contract to exceed the amount appropriated for the original Contract, shall be issued unless Contractor is given written assurance by the City that lawful appropriations to cover the costs of the

## CITY OF COMMERCE CITY

additional Work have been made or unless payment for such Work is otherwise provided for by the City.

9. PROJECT MANAGER. The Project Manager for this contract is Tony Jaramillo.

10. Undocumented Workers.

a. Contractor hereby certifies that, as of the date of this Agreement, it does not knowingly employ or contract with an illegal alien who will perform work under this Agreement and that Contractor will participate in the E-verify Program or Department Program as defined in C.R.S. § 8-17.5-101 in order to confirm the eligibility of all employees who are newly hired to perform work under this Agreement.

b. Contractor shall not knowingly employ or contract with an illegal alien to perform work under this Agreement or enter into a contract with a subcontractor that fails to certify to Contractor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this Agreement.

c. Contractor is prohibited from using either the E-verify Program or Department Program procedures to undertake pre-employment screening of job applicants while this Agreement is being performed.

d. If Contractor obtains actual knowledge that a subcontractor performing work under this Agreement knowingly employs or contracts with an illegal alien, Contractor shall:

i. Notify the subcontractor and the City within three (3) days that Contractor has actual knowledge that the subcontractor is employing or contracting with an illegal alien; and

ii. 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 Contractor shall 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.

e. Contractor shall comply with any reasonable request by the Colorado Department of Labor and Employment (the "Department") made in the course of an investigation that the Department is undertaking pursuant to the authority established in Article 17.5 of Title 8, C.R.S.

f. If Contractor violates this Section, the City may terminate this Agreement for breach of contract. If this Agreement is so terminated, Contractor shall be liable for actual and consequential damages to the City.

## CITY OF COMMERCE CITY

11. NOTICES. Written notices required under this Contract and all other correspondence between the parties shall be directed to the following and shall be deemed received when hand-delivered or three (3) days after being sent by certified mail, return receipt requested:

If to the City:

Public Works Director  
City of Commerce City  
8602 Rosemary St.  
Commerce City, CO 80022

If to Contractor:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12. 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.

- a. Contractor Responsible for Tax. 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.
- b. 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>.
- c. Equipment. Prior to or on the date Contractor locates equipment within the City to fulfill this Contract, 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 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, 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 Contractor fails to declare the equipment to the City prior to or on the date 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.

13. GENERAL PROVISIONS.

- a. Definitions. The Definitions in the General Conditions apply to the entire Contract unless expressly modified within the Contract Documents.

## CITY OF COMMERCE CITY

- b. Counterparts. This Contract may be executed in two or more copies, each of which shall be deemed an original. The City shall retain one copy, and one copy shall be delivered to Contractor. Additional copies, if any, shall be provided to any additional parties
- c. Entire Agreement; Binding Effect. This Contract contains the entire agreement of the parties relating to the subject matter hereof and, except as provided herein, may not be modified or amended except by written agreement of the parties. This Contract shall be binding upon, and shall inure to the benefit of, the parties and their respective heirs, personal representatives, successors and assigns.
- d. Independent Contractor; No Partnership or Agency. Notwithstanding any language in this Contract or any representation or warranty to the contrary, the relationship between Contractor and the City shall be as independent contractors, and neither the City nor Contractor shall be deemed or constitute an employee, servant, agent, partner or joint venturer of the other. **Contractor is obligated to pay federal and state income tax on any money earned pursuant to this Contract, and neither Contractor nor Contractor's employees, agents or representatives are entitled to workers' compensation benefits from the City.**
- e. Governing Law and Venue; Recovery of Costs. This Contract shall be governed by the laws of the State of Colorado, and venue shall be in the County of Adams, State of Colorado. In the event legal action is brought to resolve any dispute among the parties related to this Contract, the prevailing party in such action shall be entitled to recover from the non-prevailing party reasonable court costs and attorney fees.
- f. Governmental Immunity. No term or condition of this Contract shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections or other provisions of the Colorado Governmental Immunity Act, C.R.S. §§ 24-10-101, *et seq.*
- g. No Assignment. Contractor shall not assign this Contract without the City's prior written consent.
- h. No Third-Party Beneficiaries. It is expressly understood and agreed that enforcement of the terms and conditions of this Contract and all rights of action relating to such enforcement shall be strictly reserved to the parties. It is the express intention of the parties that any person other than the City and Contractor shall be deemed to be only an incidental beneficiary under this Contract.
- i. No Continuing Waiver.
  - i. The waiver of any term, provision or requirement of this Contract shall not be construed or deemed as a waiver of any other term, provision or requirement of this Contract.
  - ii. The one-time waiver of any continuing obligation under this Contract shall not be construed or deemed as a continuing waiver of such obligation.

**CITY OF COMMERCE CITY**

- iii. The waiver of any breach of a term, provision or requirement of this Contract shall not be construed or deemed as waiver of any subsequent breach thereof.
- j. Severability. In the event a court of competent jurisdiction holds any provision of this Contract invalid or unenforceable, such holding shall not invalidate or render unenforceable any other provision of this Contract.
- k. Headings. Paragraph headings used in this Contract are for convenience of reference and shall in no way control or affect the meaning or interpretation of any provision of this Contract.
- l. Acknowledgement of Open Records Act – Public Document. Contractor hereby acknowledges that the City is a public entity subject to the Colorado Open Records Act, C.R.S. § 24-72-201, *et seq.* (the “Act”), and as such, this Contract and any exhibits or attachments hereto, and any documents or reports produced pursuant to this Contract, are subject to public disclosure under the Act.

**[Remainder of this page intentionally blank. Signature pages follow.]**

IN WITNESS WHEREOF, the parties have executed this Agreement as of the Effective Date.

**CITY OF COMMERCE CITY**

\_\_\_\_\_  
Brian K. McBroom, City Manager

ATTEST:

\_\_\_\_\_  
Laura J. Bauer, CMC, City Clerk

Approved as to form:

\_\_\_\_\_  
Robert R. Gehler, City Attorney

Recommended for approval:

\_\_\_\_\_  
\_\_\_\_\_

**CITY OF COMMERCE CITY**

**COMPANY**

Signature

Printed Name &amp; Title

STATE OF COLORADO )  
 ) ss.  
COUNTY )  
OF )

The foregoing Agreement was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_.

Witness my hand and official seal.

My Commission Expires\_\_\_\_\_.

Notary Public

CITY OF COMMERCE CITY

**NOTICE TO PROCEED**

CITY OF COMMERCE CITY, COLORADO

Date: \_\_\_\_\_

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

You are hereby notified to proceed on this date for the construction of the **Fronterra Park, Project Number PRG-03-2014**, for the City of Commerce City, Colorado, as set forth in detail in the Contract Documents, including Plans and Specifications.

Further, you are to complete the work within 200 calendar days after the date first appearing above, or no later than \_\_\_\_\_, 20\_\_.

CITY OF COMMERCE CITY

\_\_\_\_\_  
Tony Jaramillo, Project Manager  
Department of Parks, Recreation & Golf

For: Carolyn J. Keith, CPRP, Director  
Department of Parks, Recreation & Golf

We have determined the following permit(s) is/are required:

1. City of Commerce City General Contractor's License

If you will not complete your work involving these permits and/or licenses within the allotted time specified thereon, you are required to communicate with the Project Manager to determine extension requirements. If you encounter other permits and/or licenses being required, please communicate immediately with the Project Manager.

**CITY OF COMMERCE CITY**

**ACCEPTANCE OF NOTICE**

Receipt of the above Notice to Proceed is hereby acknowledged by \_\_\_\_\_  
\_\_\_\_\_ this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

By: \_\_\_\_\_

Title: \_\_\_\_\_

Telephone: \_\_\_\_\_

Company or Corporation Name:

\_\_\_\_\_



## CITY OF COMMERCE CITY

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# **CITY OF COMMERCE CITY**

## **GENERAL CONDITIONS**

### **1. INTENT OF PLANS/DRAWINGS AND SPECIFICATIONS**

a. The Contract Documents are intended to be complementary, and work called for on any drawing and not mentioned in the Plans or Specifications, or work described in the Plans and Specifications and not shown on any drawing, is to be regarded as included under this Contract the same as if it were set forth in the Plans and Specifications and exhibited on the Drawings.

b. The prices shown in the Contract Documents shall include the cost of all labor and materials, testing, surveying, equipment and services, and all other expenses necessary for the complete execution of the Work contracted for so that it will function as a working unit of the Plans of which it will be a part.

c. In interpreting the Contract Documents, words describing materials, or work having a well known technical or trade meaning, unless otherwise specifically defined, shall be construed in accordance with such well known meaning recognized by engineers, architects, surveyors and the trades. In resolving inconsistencies among two (2) or more of the Contract Documents, precedence shall be given in the following respective order:

- (1) Contract Agreement;
- (2) Plans/Specifications and Drawings;
- (3) Special Conditions (Technical Specifications);
- (4) General Conditions.

### **2. WORKMANSHIP AND MATERIALS**

Unless otherwise provided for in the Plans and Specifications, all workmanship, equipment, materials and articles incorporated in the work performed under this Contract are to be the best of their respective kinds, new and undamaged. Prior to procurement, Contractor shall furnish to the Project Manager for approval, the name of the manufacturer of machinery and other equipment for materials, which Contractor contemplates incorporating in the Work. Contractor shall also furnish information on capacities, efficiencies, sizes, etc., and other information as required by the Project Manager. Samples shall be submitted for approval when requested. Machinery, equipment, materials and articles installed or used without the Project Manager's approval shall be at the risk of subsequent rejection.

### **3. MATERIALS AND EQUIPMENT FURNISHED BY CONTRACTOR**

Contractor shall furnish all materials and equipment required in the Contract Plans/Drawings and Specifications.

### **4. AUTHORITY OF THE PROJECT MANAGER**

a. The Project Manager is designated by the City to exercise all authority on its behalf under this Contract and to see that this Contract is performed according to its terms. Work under this Contract may be suspended by the Project Manager for substantial cause, and any such suspension by the Project Manager shall be without cost or claim against the City unless such suspension by the Project Manager is

## **CITY OF COMMERCE CITY**

caused in whole or in part by acts or omissions within the control of the City or persons acting on behalf of the City.

b. The Project Manager may assume or resume exclusive control of the place of performance of this Contract whenever such place of performance is located within or upon property belonging to the City. The Project Manager shall furnish all explanations, directions and inspections to satisfy himself/herself that Contractor is performing the work contemplated and provided for under this Contract; provided, however, that 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.

c. Any person employed on the Work who fails, refuses or neglects to obey the instructions of the Project Manager, or appears to the Project Manager to be incompetent, or disorderly, shall, upon the order of the Project Manager, be at once forbidden by Contractor to work on any portion of the Project covered by these Contract Documents.

### **5. CONTRACTOR'S REPRESENTATIVE**

Contractor shall have a Superintendent or other representative present who shall be Contractor's representative and have immediate charge of the Work and all of the authority and duties of Contractor hereunder. The Superintendent or representative shall have Contractor's written authority to act on Contractor's behalf.

### **6. CHARACTER OF WORKERS**

a. None but foremen and workers skilled in the work assigned to them shall be employed on work requiring special qualifications, and Contractor shall discharge from its service, when required by the Project Manager, any disorderly, dangerous, insubordinate or incompetent person employed on the Work.

b. As required by C.R.S. 8-17-101, at least eighty percent (80%) of each type or class of labor employed by Contractor and its Subcontractors to perform the Work shall be Colorado labor. "Colorado labor" means any person who at time of employment is a resident 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 Contractor and approved by the Project Manager in writing, may waive this requirement.

c. 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.

### **7. SUPPLEMENTAL DRAWINGS**

a. When required by the Specifications or Plans/Drawings, and for all undetailed material to be fabricated, Contractor shall make detailed shop drawings to amplify the Drawings referred to in the Contract before proceeding with the Work. Such drawings shall be submitted to the Project Manager online at \_\_\_\_\_. If acceptable to the Project Manager, approval of the submittal shall be sent by email to the Contractor. If changes or corrections are necessary, the Contractor shall resubmit corrected prints online.

## **CITY OF COMMERCE CITY**

b. The approval by the Project Manager of Contractor's drawings is an approval relating only to their general conformity with the Plans/Drawings and Specifications and does not guarantee detail dimensions and quantities.

### **8. RIGHTS-OF-WAY**

a. Except as pertains to utility structures that are governed by these General Conditions at the sections titled "Rights and Responsibilities of Contractor: Rejected Materials and Work and Protection of Existing Facilities" below, the City will provide right of access to all places necessary for the performance of the Work. The City will make best efforts to provide right of access in a timely manner. However, the City shall not be liable to Contractor for any delay in providing right of access outside the City's control. Nothing contained herein shall be interpreted as giving Contractor exclusive occupancy of the area provided by the City.

b. The City and other contractors of the City may for any purpose, but without unreasonably interfering with prosecution of the Work, enter upon or occupy portions of the land furnished by the City. When the area provided for performance of one contract is required for the execution of another contract, the privilege of access, or any other reasonable privilege, shall be afforded by Contractor at all times necessary. Joint occupancy or use of the territory shall not be made the basis of any claim for delay or damages unless such delay or damage is caused in whole or in part by acts or omissions within the control of the City or persons acting on behalf thereof.

### **9. OTHER CONTRACTS**

The City reserves the right to allow others to contract in connection with the Work. Contractor shall afford other contractors reasonable opportunity for the introduction and storage of materials and the execution of work and shall coordinate Contractor's work with the other contractors.

### **10. WORK CHANGES**

a. Upon prior approval of the Project Manager given by written Change Order, the City may, at any time during the progress of the Work, make alterations to the Work without consent of the Surety. The Work, as changed, shall be performed as if originally specified and shall in no way invalidate the Contract. Any difference in the Cost shall be added to or deducted from the amount of the Contract, as the case may be, as specified in the Change Order. Adjustments in the amounts to be paid to Contractor on account of changed work shall be determined by one of the following methods in the order listed, the earlier listed being used unless impractical:

- (1) Unit prices submitted in Contractor's Contract Proposal.
- (2) Unit prices agreed upon.
- (3) Acceptable lump sum.

b. When, in the judgment of the Project Manager, it is impractical due to the nature of the changed work to fix the amount to be paid for it by any of the above methods, the amount payable shall be adjusted on the basis of The bid form submitted.

c. "Actual cost" shall include all expenditures for materials furnished and used by Contractor, labor costs, including the foreman in direct charge of the specific operation, and rental for power tools or specific equipment that may be required, based on the rental rates for equipment as shown

## CITY OF COMMERCE CITY

on the "Equipment Rental Rates Schedule" of the Associated General Contractors of America. The "actual cost" is to be agreed upon or specified by the Project Manager in writing before the Work is begun, but will not include any allowance for office expenses, general superintendent, other general overhead charges, depreciation or maintenance charges.

- d. No claim for additional payment shall be valid unless authorized in writing.

### **11. RIGHT TO ANNUL CONTRACT**

The City shall, at any time, have the right to annul the Contract upon giving written notice to Contractor. In such event Contractor shall be entitled to the full amount of the approved estimate for the work done by it under the Contract up to the time of such annulment, including the retained percentage. Contractor shall be reimbursed by the City for such expenditures as, in the judgment of the Project Manager, are not otherwise compensated for.

### **12. PERFORMANCE OF THE WORK – DELAY OR VIOLATION**

If the performance of the Work is unnecessarily or unreasonably delayed by Contractor, or if any of the provisions of this Contract are being violated by Contractor or its Subcontractors, the Project Manager may serve written notice upon Contractor and the Surety of such delay or violation. If, within five (5) calendar days after serving notice, such delay or violation is not corrected, the Project Manager shall immediately serve notice thereof, and the Surety shall have the right to take over and perform the Work. If the Surety does not commence performance of the Work within ten (10) calendar days from the date of said notice, the City may take over the Work and, without prejudice, prosecute the Work to completion, and Contractor and its Surety shall be liable to the City for any cost incurred by the City over and above the Contract Cost and for any Liquidated Damages to which the City is entitled pursuant to the Contract.

### **13. RIGHT TO ACCEPT PORTION OF WORK**

The City reserves the right to accept and make use of any completed section of the Work without invalidating the Contract or obligating the City to accept the remainder of the Work or any portion thereof. Payment shall be made for the portion of Work accepted, and such payment shall be determined by the Project Manager from the unit price(s) found on the Bid at quantities not exceeding those found on the Bid.

### **14. COMPLETENESS OF WORK**

Before final acceptance, all parts of the Work shall be examined and tested, if necessary, and each part shall be in good condition and working order or shall be placed in good condition and working order at Contractor's expense. All tests of completed Work and equipment required under this Contract shall be made under the direction of the Project Manager, at the expense of the City, who shall repair at its own expense any damage resulting therefrom.

### **15. DUTIES OF PROJECT MANAGER**

- a. Determinations for Payment. The Project Manager shall make all determinations of amounts and quantities of the Work. Contractor shall make available for inspection any records kept by it.

- b. Quality Assurance. The City will provide its own inspection for the Project.

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c. Access to Work. The Project Manager and his/her representatives shall at all times have access to the Work wherever it is in preparation or progress and Contractor shall provide proper facilities for such access and inspection. The uncovering, testing and/or removing of portions of finished Work, if such is necessary, shall be paid for by Contractor if the Work has not been reported to the Project Manager and accepted by him.

d. City Inspection of Work.

(1) Inspector(s) shall be appointed by the Project Manager to inspect materials used and Work done. Inspections may extend to all or any part of the Work and to the preparation or manufacture of the materials to be used. The inspectors will not be authorized to alter the provisions of the Plans and Specifications or delay the fulfillment of the Contract by failure to inspect materials and Work with reasonable promptness. An inspector cannot issue instructions contrary to the Plans/Drawings and Specifications or act as foreman for Contractor. The inspector shall have authority to reject defective materials and to suspend any Work that is being done improperly subject to the final decision of the Project Manager.

(2) If sub-standard material not conforming to the requirements of the Drawings and Plans/Specifications has been delivered to the Project or has been incorporated in the Work, or if work has been performed of inferior quality, such material or work shall be considered defective and shall be removed and replaced as directed by the Project Manager at the expense of Contractor. All materials shall be subject to examination and test by the Project Manager at any time during manufacture.

(3) The City reserves the right to reject defective materials during manufacture or before they have been incorporated into the Work. If Contractor fails to replace rejected materials, the City may replace them or correct defective work and charge the cost thereof to Contractor or may terminate the right of Contractor to proceed. Any failure to earlier detect defective materials or workmanship shall not impair the City's right to a completed Project in accordance with the requirements of the Contract.

(4) Inspection of the Work shall in no way be construed to relieve Contractor of full compliance with the Contract Documents.

e. Suspension of Work - Weather Conditions. The Project Manager may order Contractor to suspend work that may be damaged or endangered by adverse weather. When adverse weather is unusual and extensive, an extension of time may be granted to Contractor by the Project Manager.

f. Weather Days. Colorado weather conditions should be anticipated and built into the schedule for performance.

## 16. RIGHTS AND RESPONSIBILITIES OF CONTRACTOR

a. General.

(1) Contractor hereby agrees that it is satisfied as to the nature and location of the Work, the character, quality and quantity of the materials to be encountered, including sub-surface conditions, the equipment and facilities needed to prosecute the Work, the local conditions and all other matters that can affect the Work.

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(2) If Contractor, in the course of completing the Work, finds a discrepancy between the Drawings and the physical conditions, or finds any errors or omissions on the Drawings, it shall be Contractor's duty to immediately inform the Project Manager in writing, and the Project Manager shall promptly investigate and make any determination required by the circumstances. Any Work done after such discovery, until authorized, will be done at Contractor's risk. In all cases, the Project Manager shall decide the intent of the Plans/Drawings and Specifications and his decision shall be final and binding.

b. Staging and Storage Sites. Contractor may, with approval of the Project Manager, obtain sites of his/her choosing for equipment storage and/or materials stockpiling. A list of such sites shall be submitted to the Project Manager for approval at least five (5) days prior to intended use. For each site submitted for the Project Manager's approval, the proposed truck route for ingress and egress to the site shall be shown. Contractor shall not occupy storage sites without prior written approval by the Project Manager. For all sites approved and used, Contractor shall be responsible for the following:

(1) Obtaining prior written permission of the owner. A copy of this permission shall be provided to the City.

(2) Keeping stockpiles and equipment confined within the approved area and in accordance with the City's Erosion Control requirements.

(3) Providing security for materials and equipment at the site.

(4) Providing for public safety at the site.

(5) Keeping access roads clean and in good condition and in accordance to the City's Erosion Control requirements.

(6) At Contractor's sole cost expense, restoring the site to its original or better condition, as determined by the Project Manager.

c. Traffic Control.

(1) The flow of traffic on streets shall be reasonably maintained at all times during construction. The roadway shall be properly maintained and Contractor shall coordinate its operations with the City Transportation Engineer as to approval of detours (if any), parking areas for workers' private vehicles, access to private property, etc.

(2) Contractor shall provide a safe roadway and shall erect and maintain warning signs, barricades and sufficient safeguards around all excavations, embankments and obstructions. Contractor shall provide suitable warning lights or flares and shall keep them lit at night and other times when visibility is limited. Contractor shall provide such flagmen and watchmen as may be determined by the Project Manager for the protection of the public.

(3) Except for those cases where construction is actually taking place on a sidewalk, construction signs shall not be placed on sidewalks.

(4) Contractor shall, not less than ten (10) working days prior to the start of the Work, submit to the City Transportation Engineer for approval a Traffic Control Plan, which shall include the layout of all signing, barricades, lighting and flagging and whether Uniformed Traffic Control ("UTC") may be required for any part of the Project. In the event UTC may be required, Contractor



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shall coordinate with the Commerce City Police Department (“CCPD”) and use only CCPD for its UTC. The Traffic Control Plan shall conform to the Manual on Uniform Traffic Control Devices. The approved Traffic Control Plan shall be implemented prior to the start of any construction.

(5) On Colorado State Highways, no work in the roadway shall begin before 8:30 A.M. and all equipment shall be off from the roadway before 3:30 P.M. each day.

(6) Construction signs shall be turned away from traffic when not in use. When not in use during evening hours, construction signs shall be moved at least eight (8) feet from the nearest edge of the traveled way.

(7) Any violation of the approved Traffic Control Plan shall result in a written notice to stop work imposed on Contractor. Work shall not resume until Contractor assures the Project Manager, in writing, that there will not be a recurrence of the violation. If additional violations take place, the Project Manager will notify Contractor in writing that a price reduction charge will be imposed for each additional incident. The incident price reduction charge will be deducted from any money due to Contractor. The price reduction will not be considered a penalty, but will be a price reduction for failure to perform traffic control in compliance with the Contract.

(a) An “incident” is defined as any violation lasting up to thirty (30) minutes. A price reduction will be assessed for each successive or cumulative 30-minute period in violation of the traffic control plan, as determined by the Project Manager.

(b) The price reduction for each incident will increase at a progressive rate starting at One Hundred Fifty Dollars (\$150) for the second incident and increasing to One Thousand Two Hundred Dollars (\$1,200) for the fifth and subsequent incidents in accordance with the following Price Reduction Schedule.

PRICE REDUCTION SCHEDULE	
<u>INCIDENT</u>	<u>INCIDENT RATE</u>
1 <sup>st</sup>	Notice to Stop Work
2 <sup>nd</sup>	\$150
3 <sup>rd</sup>	\$300
4 <sup>th</sup>	\$600
5 <sup>th</sup>	\$1,200
subsequent	\$1,200

d. Surveying and Similar Tasks. No lines, grade staking or other surveying task will be furnished by the Project Manager. Contractor shall provide for its own surveying tasks. All bench marks and monuments shall be preserved by Contractor. In case Contractor or its employees destroy bench marks or monuments, a professional land surveyor, licensed in the state of Colorado, will replace them at Contractor’s expense. Contractor shall satisfy itself as to the accuracy of all lines and grades prior to proceeding to use such lines and grades. In the event Contractor proceeds with the Work without having lines and grades set, Contractor shall in no way be relieved of strict compliance with the Contract requirements in respect hereto.

e. Quality Control. Contractor is ultimately responsible for quality of work performed. All work must be constructed within stipulated tolerances and care must be taken during installation and removal operations. Contractor is responsible for checking forms, verifying grades and testing sub-grade and materials.

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f. Scheduling and Completion of the Work. Contractor shall begin and complete the Work within the times stated in the Contract Documents. The capacity of Contractor's and forces employed shall be such as to ensure the completion of the Work within the specified period of time.

g. Coordination. Contractor's superintendent or foreman for the Project must have a radio cell phone or pager to enable the City Inspector to contact that person when necessary.

h. Rejected Materials and Work. Whenever materials or work are rejected, Contractor shall promptly remove such materials and construction from the job site and replace all rejected portions to the satisfaction of the Project Manager. In the event Contractor fails to remove rejected items from the job site within a reasonable length of time, the Project Manager may arrange for such removal at Contractor's sole expense. Contractor shall be responsible for the cost of any retesting required as a result of a failing test.

i. Utilities.

(1) Contractor shall at all times coordinate its work with the South Adams County Water and Sanitation District and with any other utility affected by the Work. In this regard, Contractor shall be responsible for coordinating removal or relocation of any utility structure(s) that interfere with the Work. In the event it becomes necessary to close existing portions of any water or sewer system due to construction, at least twenty-four (24) hours (one full weekday) prior notification must be given to the South Adams County Water and Sanitation District. Contractor shall be responsible for insuring continuity of all utilities affected by the Work. All electrical power and water required during construction shall be provided by and at the expense of Contractor. Contractor shall call the Utility Notification Center of Colorado forty-eight (48) hours prior to the start of any excavating.

(2) Protection of Existing Facilities. Contractor shall notify all affected utility companies and all other interested parties prior to commencement of work in order to insure that there will not be undue interruptions of services during progress of the Work. Existing power lines, telephone lines, trees, shrubbery, fences, water mains, gas mains, sewers, cables, conduits, ditches, embankments and other structures in the vicinity of the Work not authorized to be removed shall be supported and protected from injury by Contractor during the construction and until completion of the work affecting them. Contractor shall be liable for all damages done to such existing facilities and structures, as herein provided, and shall save the City harmless from any liability or expense for injuries, damages or repairs to such facilities.

(3) Responsibility to Repair. Contractor shall notify the Project Manager and/or owner of the existing utilities, whether above or below ground prior to proceeding with excavation wherever such operations are within fifteen (15) feet of any existing utility. Should any such utility be damaged in the operations, Contractor shall immediately notify owner of such utility, and unless authorized in writing by the owner of the Utility, Contractor shall not attempt to make repairs. Duplicate copies of any written authorization given to Contractor to make repairs shall be filed with the Project Manager and shall be so worded as to save harmless the City of any responsibility whatsoever related to the sufficiency of the repairs.

(4) Contractor shall conduct its operations in such a manner as to minimize inconvenience to the public due to disconnected utility services. Should it become necessary to temporarily disconnect any utility, Contractor shall first obtain the 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 Contractor's operations require or

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cause utility service to be disconnected beyond the time limits stated above, he shall make arrangements suitable to the Project Manager to provide temporary utility service. Such temporary service shall be at Contractor's expense. Contractor agrees to pay the cost for any temporary utility service installed either by City forces or by a third party at the direction of the Project Manager.

(5) In the event that during construction, it is determined that any underground utility conduit, including sewers, water mains, gas mains, TV cable or drainage structures or any above ground utility facilities are required to be relocated, Contractor shall notify the utility owner in advance so that any such relocations can be completed without delay to the Work.

j. Rules and Regulations of Department of Labor and Industrial Commission. Contractor shall comply with all applicable rules and regulations adopted by the Department of Labor and of the Industrial Commission of the State of Colorado or adopted by the City, whichever is more restrictive.

k. Insurance and Workers' Compensation Certificates. Contractor shall provide evidence of Workers' Compensation Insurance, Comprehensive General Liability Insurance and Automobile Liability Insurance naming the City as an additional insured on said policies as required under Section 33 below.

l. State Highway Right-of-Way.

(1) Colorado State Highway Right-of-Way shall be restored to original condition, including reseeding or sodding, if necessary. Contractor's equipment shall not be stored on traveled highway.

(2) Contractor shall ensure that no open cut is left during the hours of darkness. Road signs, delineators, etc. removed for the installation of utilities shall be restored per State Highway specifications.

(3) When applicable, Contractor shall use a scoring wheel for cutting asphalt.

m. Requests for Payment. Requests from Contractor for partial payment and final payment of amounts due under this Contract shall be on a form approved by the Project Manager. Such payment requests shall list separately each item included in the Contract Proposal. Payment shall be made in accordance with Section 18 and only for those items listed in the Contract Proposal and approved Change Orders, if any.

n. Notices. The address given in Contractor's Contract Proposal is hereby designated as the place to which all communications to Contractor shall be delivered or mailed. The delivery at the above named place by certified mail of any notice, letter or other communication to Contractor shall be considered adequate service upon Contractor, and the date of said service shall be the date of such delivery. Contractor's address may be changed at any time upon written notice to the Project Manager at least three (3) business days prior to such change.

o. Damages.

(1) Indemnification. Contractor shall be liable and responsible for any and all damages to persons or property caused by or arising out of the actions, obligations or omissions of Contractor or its employees, agents, representatives or other persons acting under Contractor's direction or control in performing or failing to perform the Services under this Agreement. Contractor shall indemnify and hold harmless the City, its elected and appointed officials and its

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employees, agents and representatives (the “Indemnified Parties”), from any and all liability, claims, demands, actions, damages, losses, judgments, costs or expenses, including, but not limited to, attorney fees, which may be made or brought or which may result against any of the Indemnified Parties as a result or on account of the actions or omissions of Contractor and/or its employees, agents or representatives or other persons acting under Contractor’s direction or control. The provisions set forth in this Section shall survive the completion of the Services and the satisfaction, expiration or termination of this Agreement.

(2) Survival; Withholding Payment. The provisions set forth in this Section 16(o) shall survive the completion of the Work and the satisfaction, expiration or termination of this Contract. The City may, if it so desires, withhold payments due Contractor as long as shall be reasonably necessary to indemnify the City hereunder.

p. Patents and Copyrights.

(1) If Contractor uses any design, device, material or process covered by letters, patents, or copyright, in the construction of the Work under this Contract, the use of which has not been specified or required by the Drawings and Plans/Specifications, the right for such use shall be provided for by a suitable legal agreement with the patentee or owner. A copy of such agreement shall be filed with the City. Contractor and the Surety shall indemnify and save harmless the City from any and all claims including court costs and legal fees for infringements on any such patented design, device, material, process or any trademark, or copyright during the prosecution or after the completion of the Work.

(2) 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 Plans/Specifications, the City shall be responsible for any claims for infringement by reason of the use of any such design, device, material process, or product of a particular manufacturer, but Contractor shall pay any royalties or license fees therefore.

q. Protests.

(1) If Contractor considers any work demanded of it to be outside the Contract requirements, or if it considers any ruling of the Project Manager to be unfair, it shall immediately ask for a written instruction or decision and shall proceed to perform the work to conform to the Project Manager’s ruling. If Contractor considers such instructions unsatisfactory, it shall, within fourteen (14) calendar days after receipt, file a written protest with the Project Manager stating its objections and the reasons therefore. Unless protests or objections are made in the manner specified and within the time limit stated herein, Contractor hereby waives all grounds for protest.

(2) Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled as set forth in Section 42 below.

r. Contractor’s Right to Terminate Contract. If the Work should be stopped under an order of any court or other public authority for a period of ninety (90) consecutive calendar days or more, through no act or fault of Contractor, or of anyone employed by it, or should the City fail to make payments at the times provided in the Contract, Contractor shall, not earlier than seven (7) calendar days after giving written notice to the City, have the right to suspend work or, at its option, after thirty (30) calendar days have elapsed from date of said written notice, should the City continue to be in default, Contractor may terminate the Contract and recover the price of all work done and materials provided and

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all damages sustained. Such failure by the City to make payments at the times provided shall be a bar to any claim by the City against Contractor for delay in completion of the Work provided Contractor suspended the Work for that reason.

s. Civil Rights. In compliance with Title VI of 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:

(1) Compliance with Regulations. 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.

(2) Nondiscrimination. Contractor, with regard to the work performed by it after award and prior to completion of the Contract 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. 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.

(3) Solicitations for Subcontractors. 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.

(4) Governor's Executive Order. 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.

(5) Incorporation of Provisions. 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. 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 Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or supplier as a result of such direction, Contractor may request the City to enter into such litigation to protect the interest(s) of the City.

t. Americans with Disabilities Act. The City of Commerce 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 Commerce City A.D.A. Coordinator 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.

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### 17. PROGRESS AND CONTROL OF THE WORK

a. Commencement of the Work. Before work is started and materials ordered, Contractor shall meet and consult with the Project Manager relative to materials, equipment and all arrangements for commencing prosecuting the Work. The Work shall be commenced at such time and in or on such part or parts of the Project, and with such forces of workers, materials and equipment as may be required to complete the Work provided for in the Contract in a condition acceptable under the Contract and within the time specified therein.

b. Progress. Contractor shall furnish a bar-chart schedule (Gantt Chart) of expected progress of the Work under the Contract showing approximate dates upon which each part or division of the Work is expected to begin and be finished. Contractor shall also, if so directed, forward to the Project Manager as soon as practical after the first day of each month, but not later than the 10<sup>th</sup> calendar day of each calendar month, a summary report of the progress of the various parts of the Work under Contract in the mills, shops and in the field, giving the existing status, rate of progress, estimated date of completion and cause of delay, if any.

c. Subcontracts. Contractor shall not sublet or subcontract any of the work to be done under the Contract until approval of such action has been obtained from the City through the Project Manager. Contractor agrees that it shall remain fully responsible to the City for the acts and omissions of its Subcontractors and any persons either directly or indirectly employed by its Subcontractors. Nothing contained in the Contract Documents shall be construed to create a contractual relationship between any Subcontractor and the City.

d. Delays and Extensions of Time.

(1) If Contractor is delayed at any time in the progress of the Work by any act or neglect of the City, by changes ordered in the Work, by strikes, lock-outs, fire, unusual delay in transportation, unavoidable casualties or any causes beyond Contractor's control or by any cause that the Project Manager decides justifies the delay, a request for an extension of the time for completion shall be submitted in writing to the Project Manager the first business day following such information becoming known to Contractor, and if in the opinion of the Project Manager such request is justified, such request shall be granted by written Change Order.

(2) An extension of time shall not be granted to Contractor for delays resulting from suspension of work due to any failure on Contractor's part to conform to the Plans/Drawings and Specifications.

(3) An extension of time shall not be made for any delay occurring more than seven (7) calendar days before claim therefore is made in writing to the Project Manager. In case of a continuing cause of delay, only one claim is necessary.

(4) If the Project Manager grants an extension of time pursuant to this Section, the Contract completion date as extended shall be in effect as though it were the contract time originally specified in the Contract.

(5) The cessation of work due to adverse weather shall not be construed as entitling Contractor to any extension of time within the meaning of this subsection d.

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e. Final Inspection and Acceptance. When the Work is completed and the final cleanup has been performed, Contractor shall notify the Project Manager that all Work has been completed, and the Project Manager shall, within seven (7) working days after such notice, make the final inspection.

(1) If, upon final inspection, the Project Manager finds that the Work has been completed in accordance with the requirements set forth in the Contract Documents and Contractor has fulfilled all obligations under the Contract, the City, upon the recommendation of the Project Manager, will issue in writing a "Final Acceptance" of the Work. The date of Final Acceptance shall be the date from which the warranty period is measured.

(2) If, upon final inspection, the Project Manager finds that the Work has not been completed in accordance with the requirements set forth in the Contract Documents or that Contractor has not fulfilled all obligations under the Contract, the City will not issue Final Acceptance, and the Project Manager shall compile a list of items that Contractor shall complete or fulfill to the Project Manager's satisfaction (the "Punch List"). The Punch List may identify corrective or replacement Work to be completed by Contractor, Contract obligations yet to be satisfied by Contractor or both such Work and Contract obligations.

(3) The Punch List shall be completed within fifteen (15) calendar days of substantial completion. If the time to complete the Punch List extends beyond the Contract completion date, liquidated damages for the period beyond the Contract completion date shall accrue in accordance with Section 31 in addition to the foregoing daily accrual of liquidated damages.

### 18. PAYMENTS TO CONTRACTOR

a. Partial Payments. Partial payments shall be made to Contractor periodically as follows:

(1) The Project Manager must receive requests for partial payments no later than the tenth (10<sup>th</sup>) day of the calendar month for Work completed during the previous month. Payment requests shall be on a form approved by the Project Manager. Such payment requests shall list separately each item for which payment is requested, and payment shall be made only for those items listed in the Contract Proposal. The City shall have thirty (30) calendar days to process a progress payment after receipt of a request in proper form.

(2) From each such partial payment the City may retain ten percent (10%) for contracts that total less than One Hundred Fifty Thousand dollars (\$150,000.00). For contracts that total One Hundred Fifty Thousand dollars (\$150,000.00) or more, the City may retain five percent (5%) from each partial payment except that when five percent (5%) of the total estimated compensation has been retained, and the City is satisfied that Contractor is satisfactorily performing the Contract, further retention may be waived at the Project Manager's sole discretion.

(3) The withheld percentage (the "Retainage") shall be retained until the Contract is completed satisfactorily and finally accepted by the City; provided, however, that in the event Contractor has failed to fulfill a Contract obligation, or is delinquent with regard to any taxes, fees or other financial obligations owed to the City whether or not associated with the Project, the Project Manager may continue to withhold final payment even after final acceptance of the Work, and the City shall not be obligated to make final payment until resolution of the failure has been achieved.

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(4) Bonus payments, if any, shall be paid at the time of partial payment without any portion being withheld.

(5) Partial payments shall not be construed as acceptance by the City of any part or the Work or of any material furnished, but merely as payment on an account.

b. Final Payment.

(1) Final payment shall not be issued until after Contractor has submitted the following to the Project Manager:

(a) Weight tickets, invoices, delivery slips, sales tax reimbursement forms, certification of payment to all Subcontractors and suppliers and all documentation for materials incorporated into the Project. Only materials with such documentation shall be approved for payment.

(b) One (1) copy of the construction plans red lined with any modifications made portraying the complete construction "as built."

(2) Within fifteen (15) calendar days after final acceptance of the Work, the Project Manager shall certify a final estimate showing the total Work.

(3) Subject to the provisions of subsection (a)(3) of this Section 18, the City shall make final payment to Contractor within thirty (30) calendar days after final acceptance of the Work.

(4) Final payment shall include the release of all Retainage and shall constitute full and complete payment for work, labor, materials, equipment and miscellaneous items in the Project.

## **19. SAFETY; SANITARY & CONSTRUCTION LAWS & REGULATIONS**

a. Protection of Work and Property.

(1) Contractor shall maintain adequate protection of all Work from damage and shall protect City property from injury or loss arising in connection with this Contract. Contractor shall indemnify the City from any such damage, injury or loss except such as may be directly due to errors in the Contract Documents or caused by agents or employees of the City. Contractor shall protect adjacent property as herein provided. Contractor shall provide and maintain all passage ways, guard fences, lights and other facilities required by public authority or local conditions for protection of the public.

(2) Contractor shall be responsible for protection of all public and private property on and adjacent to the site of the Work. Contractor shall use every precaution necessary to prevent damage to pipes, conduits and other underground structures and to overhead wires. Contractor shall protect from disturbance or damage all land survey monuments and property markers until an authorized agent has witnessed or otherwise referenced their location(s) and shall not remove them until directed.

(3) If any of Contractor's operations directly or indirectly destroy or damage any property, public or private, by or on account of any act, omission, neglect or misconduct in the



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execution of the Work, or in consequence of the non-execution thereof on its part, Contractor, at its, or its Surety's, sole expense, shall promptly repair or replace such property to the satisfaction of the Project Manager before the City will accept or pay for the Work. If Contractor fails to repair or replace such property, the City, at its sole discretion, may undertake such repair or replacement and deduct the cost of the same from amounts payable to Contractor under the Contract.

(4) Except where construction is actually taking place on a sidewalk, construction signs shall not be placed on sidewalks.

b. Accident Prevention. Contractor shall at all times take all precautions necessary to ensure the protection of the Work and the safety of the public. Contractor shall furnish, erect and maintain at its sole expense, all necessary barricades, suitable and sufficient flashers and construction signs and shall provide a sufficient number of flagmen and watchmen.

c. Sanitary Regulations. Contractor shall be responsible for providing proper health and sanitation facilities for its employees and Subcontractors.

(1) Contractor shall fully comply with all applicable rules and regulations of the Colorado Board of Health or other similar body.

(2) Contractor shall at all times provide a sufficient supply of safe drinking water for its employees and shall give orders against the use of water known or believed to be unsafe.

(3) At convenient places, Contractor shall provide fly-proof outside toilets, which shall be maintained in a sanitary condition. Toilets shall not be permitted in any water reservoir area and shall not be permitted where they may pollute a water supply.

d. Compliance with Construction Laws and Regulations. Contractor shall comply with all laws and ordinances, and the rules, regulations or orders, of all public authorities relating to the performance of the Work herein. If any provision of this Contract or the Documents attached hereto is at variance therewith, Contractor shall notify the Project Manager promptly on discovery of such variance.

### **20. PREVENTION OF WATER POLLUTION**

a. Contractor shall comply with applicable Federal and State laws, orders, rules and regulations concerning the control and abatement of water pollution.

b. If the City is determined by any federal, state, or local government agency, department, board or commission, or in any judicial proceeding, to have violated any such environmental protection rules, laws or regulations as a result of Contractor's acts or omissions, Contractor agrees to indemnify and hold harmless the City from any and all prosecutions, payment of any and all fines or penalties and the cost of abatement and remediation, except that Contractor shall not be required under this section to indemnify the City from any amounts attributable to the negligence of the City or its officers, agents or employees.

c. Contractor's construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris and other pollutants and wastes into streams, flowing or dry watercourses and underground water sources. Such pollutants and wastes include, but are not limited to, refuse, garbage, cement, concrete, sewage effluent, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts and

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thermal pollution. Sanitary wastes shall be disposed of by land burial at approved sites or by other approved methods.

d. Dewatering work for structure foundations or earth work operations adjacent to, or encroaching on, lakes, streams, creeks or water courses shall be conducted in a manner to prevent muddy water and eroded materials from entering lakes, streams, creeks or water courses by construction of intercepting ditches, bypass channels, barriers, settling ponds or by other approved means. Excavated materials shall not be deposited or stored in, or alongside of, any lake or watercourse where it can be washed away by high water or storm runoff during a 100-year storm event or the equivalent thereof.

e. Waste water from aggregate processing, concrete batching or other construction operations shall not enter the streams, creeks, watercourses or other surface waters without the use of 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 waste waters discharged into surface waters shall conform to applicable discharge standards of the Colorado Department of Health and the Federal Government. The costs of complying with this Section shall be included in the price Bid in the Contract Proposal.

### **21. ABATEMENT OF AIR POLLUTION**

a. Contractor shall comply with all applicable Federal, State and local laws and regulations concerning the prevention and control of air pollution.

b. If the City is determined by any federal, state or local government agency, department, board or commission, or in any judicial proceeding, to have violated any such environmental protection rules, laws or regulations as a result of Contractor's acts or omissions, Contractor agrees to indemnify and hold harmless the City from any and all prosecutions, payment of any and all fines or penalties and the cost of abatement and remediation, except that Contractor shall not be required under this section to indemnify the City from any amounts attributable to the negligence of the City or its officers, agents or employees.

c. In the conduct of construction activities and operation of equipment, Contractor shall use such methods and devices as are reasonably available to control, prevent or otherwise minimize atmospheric emissions or discharges of air contaminants.

d. The emission of dust into the atmosphere is not permitted during the manufacture, handling or storage of concrete aggregates, and Contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. Contractor's method(s) of storing and handling cement and pozzolans shall also include a means of eliminating atmospheric discharges of dust. Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.

e. Burning of materials resulting from clearing of trees and brush, combustible construction materials and rubbish will be permitted only when Contractor has received a valid "BURNING PERMIT," issued by the Tri-County District Health Department, or successor health department, and such burning conforms to the requirements of the permit. The cost of complying with this Section 21 shall be included in the prices bid in the Contract Proposal.

## **CITY OF COMMERCE CITY**

### **22. DUST ABATEMENT**

a. During the performance of the Work or any operations appurtenant thereto, whether on right-of-way provided by the City or elsewhere, Contractor shall furnish all labor, equipment, materials and means required, and shall carry out proper and efficient measures whenever and as often as necessary, to reduce dust, and to prevent dust originating from Contractor's operations from damaging crops, orchards, cultivated fields and dwellings or from causing a nuisance to persons or animals.

b. If the City is determined by any federal, state, or local government agency, department, board or commission, or in any judicial proceeding, to have violated any such environmental protection rules, laws or regulations as a result of Contractor's acts or omissions, Contractor agrees to indemnify and hold harmless the City from any and all prosecutions, payment of any and all fines or penalties and the cost of abatement and remediation, except that Contractor shall not be required under this section to indemnify the City from any amounts which are attributable to the negligence of the City or its officers, agents or employees.

c. Contractor shall be held liable and shall indemnify the City from any damage resulting from dust originating from Contractor's operations.

d. The cost of sprinkling or of other methods of reducing formation of dust shall be included in the price Bid in the Contract Proposal. Contractor shall cooperate with the Project Manager and other public officials in such dust abatement.

### **23. SAMPLES AND TESTS**

a. In the absence of direct references, the sampling and testing of materials shall be done in accordance with the current accepted methods approved by the American Society for Testing and Materials, the American Association of State Highway and Transportation Officials or the State of Colorado, Department of Highways, Standard Specifications for Road and Bridge Construction – 2011. Contractor shall cooperate with the Project Manager in the collection and forwarding of required samples and shall furnish all samples and test results without charge to the City. All testing shall be conducted by an independent testing company or corporation. When required by the Contract Documents, certain specified materials shall not be incorporated into the Work until tests have been made and the material is found to be in accordance with the requirements of the Contract Documents. Contractor shall pay all costs of actual testing.

b. A joint (City and Contractor) pre-inspection of the site is required before mobilization. Contractor shall request such inspection, but if not requested and site inspected before the movement of any equipment onto the site, Contractor(s) of the site shall be understood to be without default. Contractor shall notify the Project Manager at least twenty-four (24) hours (one working day) in advance for all inspections when testing or sampling will take place.

The frequency of testing or sampling shall be in conformance with the most recent edition of the Field Materials Manual, Colorado Department of Transportation.

### **24. CONTRACT TIME**

The Work shall be commenced within seven (7) calendar days from and including the date of Notice to Proceed and shall be fully completed in a satisfactory and acceptable manner within the time stated in the Contract Documents. If the Work is not completed on or before that date, or an extension

## **CITY OF COMMERCE CITY**

from that date, as allowed by the Project Manager, Contractor shall reimburse the City at the cost set forth in the Contract Documents as Liquidated Damages, not a penalty, in accordance with Section 31.

### **25. EXISTING STRUCTURES AND UTILITIES**

a. Available information on the location of existing substructures and utilities has been collected and is shown on the Drawings; the result of the investigations, however, are not guaranteed to be accurate or complete. It is 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 may exist.

b. Temporary supports, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstructions encountered in the progress of work shall be furnished by Contractor at its expense and under the direction of the Project Manager. Any structures disturbed shall be restored upon completion of the Work. Contractor shall proceed with caution in the excavation and preparation of trenches so that the exact location of underground structures, both known and unknown, may be determined. Contractor, at its own expense, shall repair or replace any such structures or utilities that are broken or damaged.

c. All excavation, including shoring, pot-holing, hand digging, etc., for protection of existing structures and utilities shall be at Contractor's expense.

### **26. CLEANING AND RESTORATION**

a. Contractor shall frequently clean up, haul away and dispose of all refuse or scrap material resulting from the progress the Work, so that the site shall present a neat, orderly, safe and workmanlike appearance at all times. Contractor shall follow any and all direction from the Project Manager in this regard. Disposal of such materials shall be at an approved disposal site.

b. Upon completion of the Work, and prior to final inspection, Contractor shall remove from the construction site and any occupied adjoining property, all equipment, buildings, refuse, unused materials, forming lumber, sanitary facilities and any other materials belonging to or disposed of by Contractor or Subcontractors.

c. Any mud or other materials tracked or otherwise deposited on the roadway shall be removed daily, or as directed by the Project Manager. Contractor shall at all times protect driveways, irrigation crossings, mail boxes, shrubs, trees, sod, grass and other public and private improvements. Any such improvement damaged or destroyed by Contractor shall be repaired or replaced with like or better material at Contractor's expense before final payment is made.

d. In the event Contractor fails to clean up and restore the construction site satisfactorily within two (2) working days of completion of the Work, the City may, at its sole discretion, clean up and restore the site. The cost therefore shall be assessed against the final payment or charged to the account of Contractor's Surety.

e. Contractor shall provide and empty, each working day, one each thirty (30) gallon or larger trash can that shall be placed near each sanitary facility.

### **27. STANDARD SPECIFICATIONS AND METHODS OF TESTING MATERIALS**

References are made in the Contract Documents to standard specifications, methods of testing materials, codes, practices and requirements. Whenever such references are made, it shall be understood

## **CITY OF COMMERCE CITY**

that the edition of each respective specification, method for testing materials, code, practice or requirements in effect on the date of the Invitation to Bid shall govern unless a specific revision is referenced. Wherever any of the following abbreviations appear in the Contract Documents, they shall have the following meanings:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ACOE	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
APA	American Plywood Association
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
CDH	Colorado Department of Highways (CDOH)
CDT	Colorado Department of Transportation (CDOT)
COE	Corps of Engineers
IEEE	Institute of Electrical and Electronic Engineer
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
SAME	Society of American Military Engineers

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### **28. SALES AND USE TAX**

d. Unless specifically exempt, all construction within the City is taxable, including construction performed by a contractor on behalf of an exempt institution or governmental, religious, charitable, private or any other type of owner including the City.

e. The contractor working on such construction projects is subject to the tax on all purchases, fabrication, manufacture or other production of tangible personal property used, stored or consumed on those projects, including parking lots, roads, bridges, highways, building construction and remodeling of both public and private facilities.

f. Specific Industry Standard for Construction and Contractors (Regulation 20-S.I.15) can be provided upon request by contacting the Finance Department of the City of Commerce City, Sales Tax Division, phone number 303-289-3628.

g. Prior to or on the date Contractor locates equipment within the City to fulfill the contract, 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 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, 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 and Use Tax Code. If Contractor fails to declare the equipment to the City prior to or on the date 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.

### **29. CONTRACTOR'S LICENSES AND PERMITS**

Contractor and every Subcontractor shall be responsible for obtaining all licenses required for the Work, including a City Contractor's license. Likewise, Contractor shall be responsible to obtain any and all permits required for the Work. No charge will be made for any City permit required for the Project. However, Contractor shall pay any and all City license fees.

### **30. OVERTIME FOR CITY INSPECTORS**

When City inspectors are required to work overtime, the cost shall be at Contractor's expense, as determined by the Project Manager. The fee charged shall not exceed Fifty Dollars (\$50.00) per hour, and it shall be charged "portal to portal" from the City offices. Overtime will be charged only for inspections occurring before 7 a.m. or after 5 p.m. on weekdays and anytime on weekends or on City holidays.

### **31. LIQUIDATED DAMAGES**

a. It is mutually understood and agreed by and between the parties to these Contract Documents, in the execution of the same, that time is of the essence in the performance of this Contract. It is expressly agreed to by the parties that actual damages are incapable of calculation. In the event that Contractor fails to complete the Work to be performed under this Contract by and at the completion time required in this Contract, after due allowance for any extension(s) of time made in accordance with this Contract, Contractor shall pay unto the City as and for Liquidated Damages, and not as a penalty.

## CITY OF COMMERCE CITY

(1) Each and every calendar day that Contractor is in default of completing the entire Project beyond 200 days from Notice To Proceed The sum of \$500 per calendar day.

(2) Failure to complete the Work as itemized in Section 16(f); and

(3) Failure to complete the Punch List pursuant to Section 17(e)(3). The sum of \$100 per day.

b. Extensions of time granted by the City in accordance with the provisions of the section titled "Progress and Control of the Work: Delays and Extension of Time" in these General Conditions shall not operate to the contrary, unless such extensions granted by the City specifically provide for the waiving of Liquidated Damages during and over such period of time extension.

c. The Contract Period from which the Contract date shall be measured is the date that the City dates and signs the Notice to Proceed.

d. Liquidated Damages shall be waived for and during the extent of any delay caused by the inability of Contractor to obtain materials or equipment by reason of Federal embargoes, priority government orders or other restrictions imposed by the United States Government, provided that adequate evidence is presented by Contractor to prove such delay and to enable the City to determine with exactness the extent and duration of such delay for each item of material and equipment involved. Provided, however, any extensions of time for performance of the Contract except for weather conditions as provided in the section titled "Duties of Project Manager" under "Suspension of Work – Weather Conditions" and "Weather Days," must be granted by a written Change Order to permit Liquidated Damages to be waived for any such delay.

e. The City shall have the right to deduct said Liquidated Damages from any monies in its hands, otherwise due, or to become due, to Contractor or to sue for and recover compensation for damages for nonperformance of this Contract at the time stipulated herein and provided for.

### **32. ASSIGNMENT OF CONTRACTS**

There shall be no assignment of this Contract or any portion thereof without the express written consent of the City.

### **33. BOND, INDEMNIFICATION AND INSURANCE REQUIREMENTS:**

a. Indemnification. To the fullest extent provided by law, Contractor shall indemnify and save harmless the City and its officers, agents, and employees as provided in Section 16(o) above. However, Contractor shall not be required to indemnify the City from any amounts attributable to the negligence of the City or its officers, agents and employees.

b. Insurance. Contractor shall not commence work under this Contract until it has obtained all insurance required by the Contract Documents and such insurance has been approved by the City. Contractor shall not allow any Subcontractor to commence work on the Project until all similar insurance required of the Subcontractor has been obtained and approved. During the life of this Contract, and for six (6) months after completion thereof, Contractor and any Subcontractor shall procure and keep in force the insurance policies set forth below:

(1) Comprehensive General Liability Insurance insuring Contractor and the City, including any officer or agent of the City, against any liability for personal injury, bodily injury or

## CITY OF COMMERCE CITY

death, including loss or damage due to fire, arising out of any act or omission of the Contractor or its agents, employees or Subcontractors with at least Two Million Dollars (\$2,000,000) each occurrence. The limits of said insurance shall not, however, limit the liability of Contractor hereunder. The policy shall include the following coverages:

- (a) Broad form property damage;
- (b) Operations-premises liability;
- (c) Personal and advertising injury liability;
- (d) 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);
- (e) Independent Contractors Coverage;
- (f) Contractual Liability;
- (g) Completed operations/products liability;
- (h) Coverage for construction, means and methods.

(2) Workers' Compensation Insurance as required in the Colorado Workers' Compensation Act covering all employees at the Project site.

(3) Automobile Liability Insurance insuring Contractor, Subcontractors and the City, including any officer or agent of the City, 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 Project site of all motor vehicles controlled by Contractor (or a Subcontractor, as applicable) that are used in connection with the Work, whether the motor vehicles are owned, non-owned or hired, with a combined single limit of at least Two Million Dollars (\$2,000,000).

[(4) Builder's Risk Insurance in an amount acceptable to the City.]

c. Insurance Requirements.

(1) Insurance required by this Section shall be with companies qualified to do business in the State of Colorado and may provide for deductible amounts as Contractor deems reasonable for the Services, but in no event greater than Twenty Thousand Dollars (\$20,000). Each insurance policy shall contain a clause providing that it shall not be canceled or materially altered without thirty (30) days prior written notice to the City. Insurance obtained by Contractor shall be subject to approval by the City, but neither approval by the City of any insurance supplied by Contractor or a Subcontractor nor failure to disapprove such insurance shall relieve Contractor or any Subcontractor of their obligation to maintain all required insurance throughout the life of the Contract.

(2) No "Pollution Exclusion."



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a) The insurance required by this Section shall 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 shall not exclude from coverage any liability or expense arising out of or related to any form of pollution, whether intentional or otherwise.

b) In the event Contractor is unable to procure a policy of comprehensive general liability insurance in compliance with the provisions of this subsection (2), Contractor shall secure and maintain either a rider or a separate policy insuring against liability for pollution related damages, claims or suits, as described in subsection b(1) of this Section, with at least One Million Dollars (\$1,000,000) each occurrence, subject to approval by the City, which approval shall not be unreasonably withheld.

d. Proof of Insurance. When Contractor executes the Contract, Contractor shall furnish to the City and the Project Manager Certificates of Insurance evidencing that all required insurance is in full force and effect. Contractor shall require any Subcontractor to submit similar evidence before undertaking work under this Contract.

e. Receipt and Application of Proceeds of Insurance. Any insured loss under the policies of insurance required by this Part or the Special Conditions, if any, shall be adjusted with City and made payable to the City as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause. The City shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order.

f. Adjustment and Settlement of Insurance Claims. The City as trustee shall have power to adjust and settle any loss with the insurers unless a party in interest objects in writing within fifteen (15) days after the occurrence of loss to the City's exercise of this power. If such objection be made, the City as trustee shall make settlement only with the insurers in accordance with such agreement as the parties in interest may reach.

g. Payment and Performance and Other Bonds.

(1) The payment bond form and the performance bond form found elsewhere in this document or forms substantially similar thereto, at the sole discretion of the City, are to be copied, completed and attached. No combined form shall be allowed. Each bond shall be separate and on the prescribed form.

(2) Contractor shall furnish a Payment Bond and a Performance Bond, each in an amount equal to at least the amount of the Contract Price as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These Bonds shall remain in effect at least until one (1) year after the date of final payment. Contractor shall also furnish such other Bonds as are required by the Special Conditions (if any).

(3) All Bonds shall be in the forms prescribed by the Contract Documents and executed by such Sureties as: (i) are licensed to conduct business in the State of Colorado; and (ii) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Chapter 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the Authority to Act.

## **CITY OF COMMERCE CITY**

(4) If the Surety on any Bond furnished by Contractor is declared bankrupt, becomes insolvent, has its right to do business in Colorado terminated or it ceases to meet the requirements of clauses (i) and (ii) of subsection f(3) herein, Contractor shall within five (5) days thereafter substitute another Bond and Surety, both of which shall be acceptable to the City.

h. Notice of Changes in Work. If notice of any change affecting the general scope of the Work or change in the Contract Price is required by the provisions of any Bond to be given to the Surety, it shall be Contractor's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. Contractor shall furnish proof of such adjustment to the City.

### **34. 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. 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 value engineering task.

### **35. SALVAGE**

Items removed by Contractor and not required for repositioning by this Contract shall become the property of Contractor unless other disposition is required by these Contract Documents. 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 Project site. Items removed by Contractor that do not have any salvage value are to be disposed of by Contractor at an approved dump.

### **36. APPROVAL OF MATERIALS AND EQUIPMENT**

#### **a. Submission of Samples and Data.**

(1) Samples, drawings, catalogue cuts and other data shall be submitted for approval of the Project Manager as required by the various sections of the Contract Documents. Items submitted shall be properly labeled to indicate the Contract number, Project name, Contractor, source of supply, manufacturer and other data required by the particular specification. All items shall be submitted in sufficient time to permit proper consideration and action thereon without delaying the approved progress schedule. Items sent for approval shall be shipped prepaid by Contractor.

b. Approval. Only materials and equipment that have been approved by the Project Manager in writing shall be used in the Work. All materials and equipment may be inspected or tested by the Project Manager at any time during their preparation and use. If, after testing, it is found that approved sources of supply do not furnish a uniform product, or if the product from any source proves to be unacceptable at any time, Contractor shall furnish approved materials from other sources. No materials that have in any way become unfit for use shall be used in the Work.

c. Testing. Contractor shall perform testing in accordance with the contract documents.

(1) 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

## **CITY OF COMMERCE CITY**

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.

(2) Mill Certificates. For materials where such practice is the usual standard, the Project Manager may accept the manufacturer's certified mill and laboratory certificate.

(3) 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.

(4) 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 Contractor's sole expense.

d. Retesting. The cost of any additional laboratory tests required through the resubmission of samples shall be borne by Contractor and shall be deducted from any money due it on this Contract.

### **37. DUTIES AND OBLIGATIONS**

The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitations, the warranties, guarantees and obligations imposed upon Contractor and all of the rights and remedies available to the City and the Project Manager thereunder, shall be in addition to, and shall not be construed in any way as limitation of, any rights and remedies available to any or all of them that are otherwise imposed or available by law or contract, by special warranty or guarantee or by other provisions of the Contract Documents, and provisions of this Section shall be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representation, warranties and guarantees made in the Contract Documents shall survive final payment and termination or completion of this Contract.

### **38. COMMUNICATIONS REGARDING THE WORK**

All communications to the City regarding the Work that is the subject of this Contract shall be directed to the attention of the Project Manager.

### **39. WARRANTY**

Contractor warrants all work, as specified in the Contract Documents, and the work of all agents, employees and Subcontractors against all deficiencies and/or defects in materials and/or workmanship for a period of one (1) year from the date found on the "Letter of Final Acceptance." Contractor further agrees to satisfy such warranty obligations that appear within the warranty period within fourteen (14) calendar days from receipt of written notice of deficiencies and/or defects and without cost to the City.

### **40. 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 Project Manager.

## **CITY OF COMMERCE CITY**

### **41. COOPERATION WITH UTILITY OWNERS**

Contractor shall cooperate with utility owners in any removal and relocation operations, so progress is expedited, duplication of work is minimized and service interruptions are avoided. Additional compensation will be allowed for foreseeable coordination, inconvenience or damage sustained due to interference from utility facilities or the removal or relocation operations as indicated in the Contract. Use of City rights-of-way by utility companies for utility lines is a common practice, and delays related to relocate utility lines should be anticipated.

### **42. DISPUTE RESOLUTION**

a. If any dispute remains unresolved after negotiation between the City and Contractor, the parties shall submit the dispute to non-binding mediation, which shall be a condition precedent to commencing litigation. 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. In the event the parties are unable to agree on a mediator, each party shall choose a mediator, and those two mediators shall choose a single mediator. 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.

b. In the event any dispute, mediation or litigation arises out of this Contract and during the time such dispute, mediation or litigation is pending, Contractor shall continue performance under the Contract in accordance with the terms and conditions hereof. Contractor's failure to continue expeditious performance due to a dispute arising under this Contract shall, at the option of the City, be construed as a material breach of this Contract justifying termination or other such action as the City deems appropriate.

CITY OF COMMERCE CITY



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Commerce City, Colorado 80022  
Phone (303) 289-3627  
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[www.c3gov.com](http://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 three and one-half percent (3.5%) to determine the amount of Use Tax payable to the City.** (Example: thirty (30) days or less =  $1/12 \times \text{purchase price of the equipment} \times 3.5\%$ )

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**

**ADDENDA**

(Staple any Addenda, if applicable, to this page)

**CITY OF COMMERCE CITY**

**SCHEDULE(S) OF CONSTRUCTION**  
(Staple Schedule(s) to this page).

**CITY OF COMMERCE CITY**

**DRAWINGS**

(Attach Drawings to the rear cover of these Contract Documents)



**CITY OF COMMERCE CITY**

**CHANGE ORDERS (when issued)**  
(Staple any Change Orders to this page).

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**SPECIAL CONDITIONS**  
*(Following This Page)*

**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, multi-use hardcourt, landscaping, irrigation, fitness stations, 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 NO. 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, staging area, construction fencing, temporary facilities, traffic control, 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 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. Excluded from this item is Seeding.

**Bid Item #3- Construction Surveying**

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 sawcutting and removal of existing curb and gutter, asphalt, crusher fines trail, and disposal of waste materials.

#### **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**

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**

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 Paving-Colored**

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 with integral color, 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 #9- Playground Ramp**

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, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

#### **Bid Item #10- Pedestrian Ramps**

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 #11- Multi-Use Sport 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 unit price per square foot, to include all materials, labor and equipment necessary to install 6-inch thick concrete sport

court, rebar 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.

#### **Bid Item #12- Parking Lot**

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 curb and gutter, concrete cross pan, concrete pan, asphalt paving, base course material, striping, handicap symbols, handicap parking sign, grading, sub grade preparation, formwork, fiber-reinforcement, concrete, 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 #13- Concrete Thickened Edge 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 unit price, to include all materials, labor and equipment necessary to install thickened 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 #14- Concrete Edging at Landscape**

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, to include all materials, labor and equipment necessary to install concrete edge, steel reinforcement, pvc weep hole, grading, sub grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

#### **Bid Item #15- Crusher Fines Path**

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 6-inch thick crusher fines, filter fabric, rolled top edging along both sides of path, grading, sub grade preparation, per the specifications, compaction of trail surface, backfill along path, disposal of excess excavated material for a complete installation.

#### **Bid Item #16- Storm Drainage**

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 RCP (size shown on plans), flared end section, riprap at outfalls, PVC drain pipes, area drains, and mitered drain outlet. 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. This bid item does not include the Fibar Drainage System.

#### **Bid Item #17- 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 tap connections, meter vault, street cutting, excavation and patching, booster pump, backflow, controller, 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 does not include the tap development fees and cost of the meter. Paid by the City of Commerce City.

**Bid Item #18- Terraced Seatwalls w/ Stone Slab Steps**

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 excavation, subgrade preparation, modular wall units including cap, geogrid, stone slab steps, filter fabric, backfill behind the wall to the limits indicated. This bid item does not include the crusher fines path.

**Bid Item #19- Playground Boulders**

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, to include boulders, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work.

**Bid Item #20- Sandblasted Boulders**

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, to include boulders, sandblasted images, lithichrome stone paint, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work.

**Bid Item #21- Landscape Boulders**

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, to include boulders, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work.

**Bid Item #22- Sandstone Distance Markers**

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, to include stone slabs, sandblasted images, lithichrome stone paint, base course material, excavation, subgrade preparation, and all materials, labor and equipment necessary to complete the work.

**Bid Item #23- 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 lump sum price, 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 #24- 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 lump sum price, 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 #25- 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, to include, picnic tables, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #26- 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, to include, trash receptacles, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #27- 6' Bench-"A"**

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, to include, bench, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #28- 6' Bench-"B"**

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, to include, bench, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #29- 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, to include, grill, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #30- 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, to include, bike racks, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #31- Restroom Building**

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, prefabricated restroom building, drinking fountains, compacted base material, wall staining, service connections to electric, water and sanitary sewer, and all materials, labor and equipment necessary to complete the work.

**Bid Alternate #32- Landscaping**

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 all trees, shrubs, ornamental grasses, perennials, shrub bed amendments, fertilizers, tree stakes, roll top edging, and wood mulch as shown on plans and all equipment, materials and labor to complete the work.

**Bid Alternate #33- Playground Equipment**

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, play equipment, mounting hardware, and all materials, labor and equipment necessary to complete the work.

#### **Bid Alternate #34- Fibar Surface Playground**

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, fibar play surface system including drainage system, fibarmats, all related excavation, grading and all materials, labor and equipment necessary to complete the work.

#### **Bid Item #35- Pedestrian 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, 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 #36- Non-Irrigated Native Seeding**

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

Payment: Payment for all work included will be at the contract unit price. The work in this bid item includes soil preparation, amendments, fine grading, seeding, mulching, fertilizing and all equipment, materials and labor to complete the work.

#### **Bid Item #37- Irrigated Native Seeding**

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

Payment: Payment for all work included will be at the contract unit price. The work in this bid item includes soil preparation, amendments, fine grading, seeding, mulching, fertilizing and all equipment, materials and labor to complete the work.

#### **Bid Item #38- Irrigated Bluegrass Seeding**

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

Payment: Payment for all work included will be at the contract unit price. The work in this bid item includes soil preparation, amendments, fine grading, seeding, mulching, fertilizing and all equipment, materials and labor to complete the work.

#### **Bid Item #39- 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. 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.

### **BID ALTERNATES**

#### **Bid Alternate #1- Embankment Slide**

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, slide, concrete paving, rubber play surface, stairs, handrailing, crusher fines path, grading, landscaping, irrigation, mounting hardware, and all materials, labor and equipment necessary to

complete the work. Base bid for this area is irrigated native seeding. This bid alternate includes alternate irrigation system as shown on plans.

### **Bid Alternate #2- Skate Area**

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, skate features, fencing, small shade shelter including lighting, boulder seating, trash receptacles, 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. Base bid for this area is irrigated bluegrass seed. This bid alternate includes alternate irrigation system as shown on plans.

### **Bid Alternate #3- Area of Irrigated Bluegrass Seed (East Side of Park)**

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

Payment: Payment for all work included will be at the contract unit price. The work in this bid item includes soil preparation, amendments, fine grading, seeding, mulching, fertilizing, irrigation system as shown on plans, and all equipment, materials and labor to complete the work.

### **Bid Alternate #4- Area of Irrigated Native Seed (South Side of Park)**

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

Payment: Payment for all work included will be at the contract unit price. The work in this bid item includes soil preparation, amendments, fine grading, seeding, mulching, fertilizing, irrigation system as shown on plans and all equipment, materials and labor to complete the work.

### **Bid Alternate #5- Area of Irrigated Native Seed (Northeast Corner of Park)**

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

Payment: Payment for all work included will be at the contract unit price. The work in this bid item includes soil preparation, amendments, fine grading, seeding, mulching, fertilizing, irrigation system as shown on plans and all equipment, materials and labor to complete the work.

### **Bid Alternate #6- Area of Irrigated Bluegrass Sod (East Playfield)**

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

Payment: Payment for all work included will be at the contract unit price. 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.

### **Bid Alternate #7- 2' Wide Addition to Existing Walk (Along Joplin Street)**

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, steel doweling to existing walk, 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 Alternate #8- 6' Wide Detached Walk With Irrigated Bluegrass Sod (Along 101<sup>st</sup> Street)**

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, to include all materials, labor and equipment necessary to install 6-inch thick concrete, grading, sub grade preparation, base course, formwork, fiber-reinforcement, one pedestrian ramp, concrete, finishing, backfill along paving, disposal of excess excavated material for a complete installation. This bid alternate includes irrigated bluegrass sod between the walk and curb and alternate irrigation system as shown on plans.

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

## **SECTION 02050**

## **REMOVAL OF PAVEMENTS AND STRUCTURES**

### **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. Building: See drawings.
  - 1. Demolish buildings 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: Bleachers, drinking fountains, and pedestrian lights.

### 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 sheepfoot 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 sheepfoot

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 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 coarse 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>Approximate<sup>1</sup> Min. Rock Weight (Pounds)</u>	<u>d<sub>50</sub><sup>*</sup> (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; \*d<sub>50</sub> = 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 <u>Mesh Sieves</u>	
	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 Type	Minimum Bedding Thickness (Inches)					Coarse Grained Soils*
	Fine Grained Soils		Type II Total			
	Type I		Type II	Total		Type II
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

**PART 1: GENERAL****1.01 Description of Work**

- A. Work includes furnishing and installing modular block retaining wall units to the lines and grades shown on the construction drawings and as specified herein.
- B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit fill, and backfill to the lines and grades shown on the construction drawings.
- C. Work includes furnishing and installing all related materials for construction of the retaining wall as shown on the construction drawings.

**1.02 Related Work**

- \* Section 02246: Geogrid soil reinforcement.

**1.03 Reference Standards**

- A. ASTM C90: Hollow load bearing masonry units.
- B. ASTM C140: Sampling and testing concrete masonry units.
- C. ASTM C145: Solid load bearing concrete masonry units
- D. UN-STD 1804
- E. ASTM 2339
- F. FHA UM-60

**1.04 Delivery, Storage, and Handling**

- A. Contractor shall check the materials upon delivery to assure that proper materials have been received.
- B. Contractor shall prevent excessive mud, wet cement, epoxy and similar materials (which may affix themselves) from coming in contact with the materials.
- C. Contractor shall protect the materials from damage. Damaged material shall not be incorporated into the retaining wall structure.

**1.05 Submittals**

- A. Samples of all products used in the work of this section.
- B. Latest edition of manufacturer's specifications for proposed materials, method of installation, and list of material proposed for use.

**1.05 Quality Assurance**

- A. Owner will supply soil testing and inspection service for quality control testing during earth work operations.

**PART 2: PRODUCTS****2.01 Concrete units**

- A. Masonry units shall be KEYSTONE® Retaining Wall Units as manufactured by Best Block Company in accordance with ASTM C-90 and ASTM C-140.
- B. Concrete wall units shall have a minimum 28-day compressive strength of 3,000 psi. The concrete shall have a maximum moisture absorption of 8%.
- C. Exterior dimensions may vary in accordance with ASTM C90. Standard and Compac units shall have a minimum of 1 sq. ft. face area each. Mini units shall have a minimum 1/2 sq. ft. face area each.
- D. KEYSTONE Standard units shall provide a minimum of 150 psf of wall face area. Fill which is contained within the dimensions of the units may be considered as 80% effective weight.
- E. Units shall have angled sides capable of concave and convex alignment curves with a minimum radius of 3.5 feet. (Where applicable, for straight walls, use non-angled straight side cap units.)
- F. Units shall be interlocked with non-corrosive fiberglass pins.
- G. Units shall be interlocked and provide either a near vertical setback or a built-in setback of 1:8. A setback of 1:16 can be achieved by integrating near-vertical and 1" setback units.

#### 2.02 Fiberglass Connecting Pins

- A. Connecting pins shall be 1/2" diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods.
- B. Pins shall have a minimum flexural strength of 128,000 psi and short beam shear of 6,400 psi.

#### 2.03 KEYSTONE KAPSEAL™ Construction Adhesive

- A. Material conforms to UN-STD 1804, ASTM 2339-70 and FHA UM-60.

#### 2.04 Base Leveling Pad Material

- A. Material shall consist of compacted sand, gravel, crushed rock, or unreinforced concrete as shown on the construction drawing. Peagravel shall not be allowed.

#### 2.05 Unit Fill

- A. Fill for units shall be free draining crushed stone or coarse gravel, 3/8" to 3/4" with (no more than 5% passing the No. 200 sieve). Gradation of the fill shall be approved by the engineer.
- B. Place recommended fill behind the retaining wall units. Peagravel shall not be used.

#### 2.06 Backfill

- A. Material shall be site excavated soils when approved by the engineer unless otherwise specified in the drawings. Unsuitable soils for backfill (heavy clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.
- B. Where borrow fill is required, contractor shall submit sample and specifications to the engineer for approval.

## **PART 3: EXECUTION**

### **3.01 Excavation**

- A. Contractor shall excavate to the lines and grades shown on the construction drawings. Contractor shall be careful not to disturb embankment materials beyond lines shown.

### **3.02 Foundation Soil Preparation**

- A. Foundation soil shall be excavated as required for leveling pad dimensions shown on the construction drawings, or as directed by the engineer.
- B. Foundation soil shall be approved by the engineer to confirm that the actual foundation soil conditions meet or exceed assumed design strength. Soils not meeting required strength shall be removed and replaced with acceptable material.
- C. Over-excavated areas shall be filled with approved compacted backfill material.

### **3.03 Base Leveling Pad**

- A. Leveling pad materials shall be placed as shown on the construction drawings, upon approved foundation, to a minimum thickness of 6".
- B. Material shall be compacted so as to provide a level surface on which to place the first course of units. Compaction shall be to 95% of Standard Proctor for sand or gravel type materials. For crushed rock, material shall be densely compacted.
- C. Leveling pad shall be prepared to ensure complete contact of retaining wall unit with base.
- D. Leveling pad materials shall be to the depth and widths shown. Contractor may opt for using reduced depth of sands, gravel or crushed rock using a concrete topping. Concrete shall be unreinforced and a maximum of 3" thick.

### **3.04 Unit Installation**

- A. Place first course of concrete wall units on the base leveling pad. The units shall be checked for level and alignment.
- B. Ensure that units are in full contact with base.
- C. Units are placed side by side for full length of wall alignment. Alignment may be done by means of a string line or offset from base line.
- D. Install fiberglass connecting pins and fill all voids at units with unit fill material. Tamp fill.
- E. Sweep all excess material from top of units and install next course. Ensure each course is completely unit filled, backfilled, and compacted prior to proceeding to next course.
- F. Lay up each course ensuring that pins protrude into adjoining courses above a minimum of 1". Two pins required per unit. Pull each unit forward, away from the embankment, against pins in the previous course, and backfill as the course is completed. Repeat procedure to the extent of wall height.



- G. As appropriate where the wall changes elevation, units can be stepped with grade or turned into the embankment with a convex return end. Provide appropriate buried units on compacted leveling pad in area of convex return end.

3.05 Cap Installation

- A. Place KEYSTONE Cap units over projected pins from units below. Pull forward to setback position. Backfill and compact to finished grade.
- B. As required, provide permanent mechanical connection to wall units with KEYSTONE KapSeal construction adhesive. Apply adhesive to top surface of unit below, and place cap unit into position.

3.06 Geogrid Installation

- A. Follow the requirements of Section 02246: Geogrid Soil Reinforcement.

**End of Section**

**PART 1 - GENERAL****1.01 Description:**

The work of this section consists of furnishing, placing, and compacting granite crusher fines on a prepared subgrade for a walk surface.

**1.02 Submittals:**

- A. If materials are obtained from a commercial source, submit certification from the supplier certifying that the granite crusher fines material meets the requirements of this section.

**1.03 Quality Assurance:**

Initial testing required to determine compliance with the requirements for the work of this section will be paid for by the Owner. Should any tests fail, the Contractor shall pay for all further testing necessary in that area to achieve requirements.

**PART 2 - PRODUCTS****2.01 Aggregate Material:**

Granite crusher fines shall be stone chips with 100 percent passing a 3/8 inch screen and which are the waste from rock crushing. The material shall contain sufficient stone powder so that it readily compacts. Submit specification and sample to Owner for approval prior to installation. Granite crusher fines is available at Aggregate Industries, contact: Mike Pyksen, tel. 303/987-1234.

**PART 3 - EXECUTION****3.01 Layout of Work:**

The Contractor shall stake or otherwise delineate the proposed alignment of the path according to the drawings. Obtain approval of the Owner prior to proceeding with excavation and subgrade preparation.

### 3.02 Subgrade Preparation:

- A. Cut/fill bench for the gravel as shown on the drawings.
- B. Cut existing grade to four inches deep within limits of paving. Wet and roll subgrade to obtain a firm, uniform, compacted subgrade. Keep cut sides vertical and true to line horizontally with a uniform width.

### 3.03 Placing:

- A. The Contractor is responsible for controlling placement of the material; no additional compensation will be made for material placement in excess of the specified thickness or width.
- B. If the required compacted depth of the aggregate base course exceeds 6 inches (6"), place course in two or more layers of approximately equal thickness. The minimum thickness of any one layer shall be four inches (4").
- C. Add water to  $\pm 2\%$  wet of optimum moisture content. Use roller or mechanical hand tamper for compaction. Compact to 95% Standard Proctor Density (ASTM D698-70) to a uniform thickness. Top of path shall be flush with adjacent grade. Remove any excess gravel on edges. Ensure that there are no low spots, high spots, or standing water on or adjacent to path.

### 3.04 Surface Finishing:

- A. Use a smooth steel wheel roller for the final rolling of top surface of Granite crusher fines. Water surface and evenly spread loose stones before final rolling. Make minimum of two complete passes over area to embed stones. Correct soft spots developed during rolling.
- B. Compacted surface shall be smooth and free from waves and other irregularities. Unsatisfactory portions of base course shall be torn up, reworked, relaid, and rerolled at no additional expense to the Owner.

**END OF SECTION**

**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 1/2-inch thick by depth of the slab material, allow 1/2 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 DESCRIPTION: The work of this section consists of the construction of reinforced concrete pipe for storm sewers and drain pipe, in accordance with the lines and grades indicated or established.
- 1-2 RELATED WORK SPECIFIED ELSEWHERE:
- A. Excavation, Trenching and Site Earthwork - Section 02221
  - B. Storm Sewer Inlets - Section 02516
  - C. Erosion Control – Section 02540
- 1-3 QUALITY ASSURANCE: Standards, American Association of State Highway and Transportation Officials (AASHTO) and American Society for Testing and Materials (ASTM).
- 1-4 SUBMITTALS: In accordance with General and Special Conditions, submit product data on all pipeline materials used and test results on pipe material by manufacturer. Submit shop drawings for all pipe and fittings.
- 1-5 PRODUCT HANDLING:
- A. Delivery: Handle pipe and fittings to insure delivery in a sound, undamaged condition.
  - B. Storage: Do not store materials on the ground. Use covers to protect materials from direct sunlight.
- 1-6 JOB CONDITIONS:
- A. Do not lay pipe when trenches or weather conditions are unsuitable for such work.

**PART 2: PRODUCTS**

- 2-1 REINFORCED CONCRETE PIPE:
- A. Reinforced concrete pipe shall comply with the requirements of ASTM Specification, Designation C76. The pipe shall be Class III unless noted otherwise on the drawings. The cement for the pipe shall conform to the requirements set forth in ASTM Specification, Designation C150 and shall be Type III and shall have a minimum compressive strength of 4,000 psi. All wall thickness shall be those established in "Wall B" in Table 3, of said C76 specification, and the reinforcement shall be as shown in the same "Wall B".
    - 1. No elliptical reinforcement will be permitted.
    - 2. Lifting holes will not be permitted in any of the pipe.
    - 3. The following shall be clearly marked on the interior surface of the pipe:
      - a. ASTM Specification
      - b. Class and size

- c. Date of manufacture
  - d. Name or trademark of manufacturer
- B. The joint design shall be bell and spigot with rubber gaskets. The gaskets for the pipe shall be neoprene and shall comply with the requirements of ASTM C443.
- C. Grout for joints shall be a non-shrink grout, Master Builders Master-flo 713 grout, or approved equal.
- D. Flared end sections, bends and tees shall comply with the requirements of ASTM C76 and shall be the same class and shall have the same joint design as the pipe described above. Temporary plugs shall be specifically manufactured for the pipelines in which they are to be installed. The plug shall be constructed of concrete and shall provide a permanent water-tight installation.
- E. The pipe will be tested by the manufacturer based on the 3-edge bearing test as set forth in ASTM Specification, Designation C76. At the Contractor's own cost, which cost shall include the pipe, testing, and report to the Engineer, the pipe shall be tested at the manufacturer's plant. Not more than 1 percent of the number of pipe lengths, but no fewer than 2 pipes for each size of pipe will be tested. The Engineer may select the pieces to be tested. In addition, visual testing will be made at the job site, and pipe will be rejected on account of any deficiencies covered by ASTM Specification Designation C76 and on account of the following:

Porous spots, inside or outside, having an area greater than 10 square inches and a depth of more than 1/4 inch.

Patched or repair of porous spots, or other defects that are not approved by the Engineer.

Exposure of reinforcement which indicates the reinforcement is misplaced.

Any broken or chip in the bell or spigot that would interfere with the gasket seal.

### PART 3: EXECUTION

#### 3-1 LAYING CONDUIT:

- A. Provide proper facilities for lowering pipe sections into place. Dropping pipe will not be permitted. Place each section true to line and gradient in close and true contact with adjacent sections.
- B. Lower segment shall be in contact with shaped bedding its full length. Bedding and backfill shall conform to details in drawings. Place bell or groove ends of conduits facing upstream.

#### 3-2 JOINING CONDUIT:

- A. The pipe bell and spigot end shall be thoroughly cleaned with a wire brush to remove any dirt or concrete. Both ends of the joint shall be inspected for

uneven surface or projection that would affect the joint. Repair damage if necessary.

- B. A lubricating solution which is not injurious to the gasket or concrete such as flax soap shall be liberally applied to the gasket groove and to the entire surface of bell ring. Following this operation, a thin film of lubricant shall be applied to the gasket which shall then be snapped into place in the groove, after which a small diameter smooth steel rod shall be inserted between the gasket and groove and run completely around the gasket to equalize the gasket tension.
- C. In the event any foreign material becomes embedded in the lubricant, or the lubricant becomes contaminated by water or other substances before the joint is started, the area affected shall be re-cleaned and new lubricant applied.
- D. The pipe being jointed shall be carefully moved into position, line and grade checked and, as the spigot end is started into the bell of the section previously laid, the gasket position shall be checked to insure uniform entry into the bell at all points. Examine the completed joint to assure that contact is complete and uniform for the full circumference.
- E. When indicated on the Drawings that alignment changes are required, the deflection shall be accomplished by the use of fabricated bends, beveled end sections or deflecting joints depending on the change required. Maximum opening shall be no more than 2-inch greater than the opposite side of the joint. Openings greater than 1-inch shall be grouted.
- F. The Contractor shall inspect the interior surface of each pipe joint and sealant location after it has been shoved home. All cracks, chips, and other defects noted in the lining shall be repaired by the Contractor with materials furnished by the pipe manufacturer. The interior joints of pipe on flat grade or where designated shall be coated and sealed with non-shrink grout materials.

END OF SECTION

**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 furnishing and installing a pvc pipe drainage system.
- 1.3 SUBMITTALS: As specified in Section 01300. Submit two copies of manufacturer's certification that pipe meets requirements of the appropriate referenced standards.
- 1.4 RELATED WORK:
  - A. Earthwork – Section 02200.

**PART 2 - PRODUCTS**

- 2.1 MATERIALS:
  - A. SUBSURFACE DRAINAGE: Shall be Nyoplast drainage structures. 1-800-821-6710 or approved equal.
  - B. 12" Nyoplast Area Drain with 6" pvc adapter.

**PART 3 – EXECUTION**

- 3.1 EXCAVATION AND BACKFILL: Refer to manufacturer's directions for installation.

END OF SECTION 02711

**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 GENERAL STATEMENT**

The specifications set forth herein pertain to the installation of an underground irrigation system.

Consultant refers to Owner's Representative

**1.2 RELATED WORK SPECIFIED ELSEWHERE**

Section 02480 - Planting, Sodding

Section 02440 - Earthwork

**1.3 SCOPE OF WORK**

- A. The applicable provisions of the General Conditions and Supplementary Conditions of these specifications shall govern the work of this section as if it were written here in full.
- B. This work shall consist of installing a complete underground irrigation system as shown on the drawings. The contractor shall include all labor, materials, permits, licenses, inspection tools, facilities, transportation and equipment necessary for the installation of a complete system according to the plans and specifications. No substitutions of material or the procedure shall be made concerning these documents without the written consent of an approved equal by the consultant. The work shall comply with the requirements of all legally constituted authorities having jurisdiction.
- C. All work in this section shall be coordinated with all utilities and trades responsible for their installation.
- D. Work called for on the drawings and details shall be furnished and installed whether or not specifically mentioned in the specifications.

**1.4 QUALITY ASSURANCE****A. Irrigation Drawings:**

The irrigation drawings are essentially diagrammatic. Due to the scale of the drawings, all characteristics of the system (i.e., sleeving, fittings, etc.) may not be represented. The contractor shall carefully inspect the site and plan his work accordingly, supplying any materials and equipment necessary to install said characteristics.

The contractor shall notify consultant of any discrepancies between site dimensions, grade differences, obstructions, etc., and those on the drawings that might not have been known during preparation of irrigation drawings. If such written notifications are not made, contractor shall assume all expenses and responsibility for any revisions

necessary.

Work called for on the Drawings by notes or on details shall be furnished and installed whether or not specifically mentioned in the specifications.

Design locations of heads, valves and lines are approximate. Contractor shall make minor adjustments of locations to avoid conflicts with planting, buildings and other obstacles. All finish grades shall be approved prior to installation of the irrigation system.

B. Experience and Observations:

1. Work shall be performed in accordance with the best standards of practice relating to the various trades. The contractor shall be highly skilled and proficient in the installation of irrigation systems of this magnitude. If requested by owner or consultant, contractor shall submit a list of three (3) projects of equal complexity with references. Contractor must have a minimum of five (5) years experience with projects of comparable size. The contractor shall coordinate installation of irrigation system with other trades on the project. Superintendent approved by the consultant shall oversee the irrigation system installation and shall be available on a daily basis. The superintendent shall not be changed unless approved by the consultant.
2. No materials of any kind shall be installed on the project until they have been approved by the consultant. The consultant reserves the right to observe installation of the irrigation system at any time and to reject any and all materials or workmanship that does not meet project specifications and standards. Materials used without prior consent of the consultant may be rejected and removed at contractor's expense. Approval of materials is for design purposes only and shall indicate that materials visually meet specifications, but this acceptance shall not relieve contractor of any guarantees. Contractor shall be responsible for the total performance of such substitution to equal or surpass the original design in every respect. Consultant reserves the right to reject installed substitution if, in his opinion, it proves unsatisfactory. Contractor shall replace substitution at his own expense.
3. Before final acceptance of the project, the contractor shall show evidence to the consultant that all submittals, etc., have been received by the owner.

4. Contractor shall give consultant forty-eight (48) hours notice with request for staking or for field observation. Head and valve staking must be approved prior to commencement of installation. Contractor to verify site conditions before commencing work. Contractor to notify consultant in written form of any site irregularities prior to commencing work. Initiation of irrigation installation implies contractor acceptance of existing conditions.

C. Ordinances and Regulations:

Contractor shall observe all state and local laws, ordinances, regulations and applicable codes concerning the materials and installation of the irrigation system. Should a conflict arise between ordinances, laws, codes, regulations and specifications, the most stringent requirements will prevail in any case.

## 1.5 SUBMITTALS

A. Material List:

1. A material list of all products and materials to be used in the project shall be submitted to the consultant prior to installation of irrigation system.
2. Consultant reserves the right to reject any and all materials that have been installed but have not been approved.
3. Contractor may request an approved equal to a product specified on the plans. Contractor must submit cut sheets of the product seven (7) days prior to bid opening to the consultant. Consultant shall respond to the request within three (3) days of receiving product information.
4. Manufacturer's warranties shall not relieve the contractor of his liability for project guarantee. Such warranties shall only supplement the project guarantee.

B. Operating and Maintenance Manuals:

1. Contractor is to deliver to owner's representatives the following before final acceptance of the irrigation system:
  - a. Index sheet of Contractor's address and phone number.
  - b. List of materials and manufacturer's representatives with addresses and phone numbers.
  - c. Operating and maintenance instructions of all equipment with shutdown and start-up procedures for the irrigation system.

C. Additional Equipment:

1. Equipment to be furnished as part of this contract to the owner at the completion of the project before final acceptance of irrigation system:
  - a. Two (2) manual drain valve keys of appropriate length;
  - b. Two (2) gate valve or stop and waste valve keys of appropriate length;
  - c. Three (3) quick coupler keys and two (2) matching hose swivels;
  - d. Two (2) sets of special tools used for maintaining and adjusting each type of sprinkler head and valve supplied;
  - e. Two (2) keys for each automatic controller;
  - f. Two (2) sprinkler heads and nozzles for each type used.

D. As-Built Drawing:

1. Before final acceptance of the irrigation system, contractor shall supply owner with a reproducible Mylar As-Built Drawing. Drawing shall include dimensioned locations of all equipment and piping as listed in the irrigation schedule on the plans. Drawing to include dimensioned changes in location of sprinkler heads, zoning changes, connection to existing water lines, and any other items as requested. As-built drawings are to be updated weekly throughout the length of the project and to be made available to the consultant. The owner shall not approve any pay requests if the As-built Drawings are not current.

If requested by owner, consultant shall review submitted As-built Drawings and reject the drawings if they are not legible, etc., or do not contain the proper equipment.

1.6 PROTECTION OF PROPERTY AND SAFETY MEASURES

A. Property and Utilities:

1. All trees, shrubs, flowers, fences, buildings, walks, roadways, and other property shall be protected from damage. Any damage to said property shall be repaired or replaced to the owner's satisfaction at the contractor's expense. Open trenches left exposed shall be flared and barricaded as per O.S.H.A. regulations by the contractor. Contractor shall restore all areas to their original condition. Contractor shall be responsible to contact utility companies and the owner's representative for staked locations of all utilities on the property. If staked utilities are damaged by the contractor, the utilities shall be repaired at the contractor's expense.
2. All trenching and other work within three feet of existing trees shall be done by hand so as not to damage tree roots or limbs. All trenches shall be no less than one foot from the trunk of any tree.
3. Promptly notify consultant of unexpected sub-surface conditions.

B. Replacement of Paving and Curbs:



1. Damage caused by trenching, crossing existing and/or proposed roadways, paths, curbing, etc., shall be kept to a minimum and all damaged areas shall be restored to their original condition at the contractor's expense. This will include compaction of subgrade to ninety-five percent (95%) relative compaction.

Restoration shall take the following course:

- a. Match existing paving sections for asphalt paving. Thoroughly compact sub-base, base course, and bituminous course, matching grade of existing paving. No rough or rolled grades will be allowed.
- b. Blacktop curbs - hot mix bituminous curb mix tamped and shaped to match adjoining curbs.
- c. Concrete paving - concrete to match adjoining concrete work, with expansion joints.
- d. Sidewalks - concrete to match adjoining concrete work.

#### 1.7 MATERIAL HANDLING, STORAGE AND CLEAN UP

##### A. Material Handling and Storage:

Contractor shall be cautious in handling and installing pipe and materials. Consultant reserves the right to reject any and all materials that are damaged. Damaged and defective pipe and equipment is to be removed from the site. Contractor shall make arrangements with the owner to store materials on site. Do not expose plastic piping to prolonged sunlight.

##### B. Clean Up:

Contractor shall endeavor to keep the site clean at all times. At the completion of the project, the contractor shall remove all construction equipment and surplus materials from the premises leaving the area in a clean and acceptable condition. Surplus materials shall include unsuitable excavated materials, rock, trash, and debris. Any equipment or debris which is not removed shall be removed at the expense of the contractor.

#### 1.8 FLUSHING, TESTING AND COVERAGE

##### A. Flushing:

All lines shall be thoroughly flushed to eliminate any foreign matter before sprinkler heads are installed.

##### B. Testing:

1. In the presence of the consultant, the contractor shall conduct a pressure test on the mainline pipe at a pressure of 100 PSI for a period of two (2) hours. Any leaks or breaks during the test shall be repaired and the mainline will be

tested until accepted. All test equipment and pumps shall be supplied by the contractor as part of the contract.

2. The contractor is responsible for providing the proper amount of water on sod and plant material to establish and sustain optimum plant growth. The watering program is to be included on As-built drawings.

C. Coverage:

After the sprinkler heads have been installed, and before installation of sod, the contractor shall conduct a coverage test in the presence of the consultant to determine if irrigated areas are receiving the proper amount of water. As directed by the consultant, the contractor shall make adjustments for proper coverage at no additional expense. This shall include changing of nozzle patterns and degrees of arc. Contractor shall perform, at no additional expense, the required work to correct any coverage problems due to deviations from irrigation plans or to problems caused by installing according to plans when it is obvious that the plans are inadequate, without bringing it first to the attention of the consultant. No overspray is permitted on any structure.

Any areas which do not conform to the designed characteristics of the drawings and unauthorized changes or poor installation practices shall be repaired or replaced by the contractor at his expense.

1.9 PRELIMINARY INSPECTION

- A. Preliminary inspection will occur after completion of entire irrigation system. Provide 48 hours notice to consultant for inspection.
- B. Preliminary inspection will evaluate the performance, coverage, appearance and conformance of the system to that of the drawings. Contractor shall rework or replace items that do not meet consultant's approval.
- C. Consultant will provide punch list of items to be corrected.
- D. Contractor will correct all punch list items at this expense.

#### 1.10 FINAL INSPECTION

- A. Upon completion of punch list items, contractor will give consultant 48 hours notice to set up final inspection. Final inspection will take place after all as-built drawings, controller charts and submittals have been provided to and accepted by the owner.
- B. If, after inspection, the consultant determines that all work conforms to the drawings, he will issue a written notice of acceptance.
- C. Final acceptance will not be given until all punch list items and subsequent new items are corrected. Funds shall be withheld from the contractor to pay for any subsequent inspection as deemed necessary by the owner to ensure compliance with contract drawings, specifications and details.
- D. If the consultant determines that the irrigation system is obviously not completed to warrant a final inspection, the contractor shall pay the consultant to cover costs for final inspection.

#### 1.11 WINTERIZATION

Contractor shall be responsible for draining of the irrigation system at the close of the 2006 sprinkling season and for start up of the system in the spring of 2007 without being requested by owner. Contractor shall use compressed air or an acceptable equivalent to drain system. Use procedures that are industry standards. Contractor shall adjust system (sprinkler heads, coverage, etc.) as part of the start up procedures.

#### 1.12 WARRANTY

It shall be the responsibility of the contractor to insure the satisfactory operation of the entire irrigation system and the workmanship and restoration of the project area. The entire system, including materials, shall be guaranteed in writing to be complete and remain operable in every detail by the contractor for a period of one (1) year from date of substantial completion of project, and the contractor agrees to make any adjustments or repair any defects occurring within the one-year guarantee period within seven (7) calendar days from receipt of notice of malfunction by the owner. If contractor neglects to perform these duties within the specified time, the owner may make such repairs at the contractor's expense; provided however, that in the case of an emergency, wherein the judgment of the owner, delay would cause serious loss or damage, repairs or replacement may be made by verbal communication and without notice being sent to the contractor, and the contractor shall pay the cost thereof. Any settling of irrigation trenches/backfill material during the guarantee period shall be repaired at contractor's expense. Contract documents shall govern irrigation replacement the same as new work. Replacements are to be made at no cost to the owner. Any vandalism to the irrigation system prior to final acceptance shall be repaired and/or replaced at contractor's expense.

### PART 2: PRODUCTS

## 2.1 MATERIALS

### A. P.V.C. Pipe

1. This specification describes the properties and performance required for polyvinyl chloride pipe. Pipe shall be suitable for use at maximum hydrostatic working pressure of 200 PSI or 160 PSI as noted on plans. Pipe shall be made from clean, virgin, NSF approved, type 1, grade 1 P.V.C., conforming to Astin Resin specification D1784-60 and project standard D2241 for P.V.C. 1120 SDR 26 or SDR 21. P.V.C. Pipe is to be belled end and solvent weld. Solvent cement and primer shall be of the type prescribed by manufacturer. Gasketed pipe shall be of the type prescribed by manufacturer. No insert gaskets or insert gasket fittings shall be accepted. Install thrust blocks in accordance with pipe manufacturer's recommendations.
2. Marking and Declaration of Compliance

Marking shall show the size, series, identification, manufacturer's trade name at intervals of not more than 20 feet. Pipe shall include the seal of approval of the National Sanitation Foundation spaced at intervals required by NSF regulations.

### B. P.V.C. Fittings:

Mainline fittings shall be Harco ductile iron IPS gasketed flanged fittings. All other pipe fittings to be schedule 40 PVC (ASTM D2466 and D1784) unless specifically noted otherwise. Solvent cement to conform to ASTM D2564.

### C. Brass Pipe and Fittings:

1. Brass pipe shall be 85% red brass, (ANSI) Schedule 40.
2. Fittings shall be medium brass, 125 pound class, screwed type.
3. Use a dielectric union wherever a copper based metal (copper, brass, bronze) is connected to an iron based metal (iron, galvanized and stainless steel).

### D. Copper Pipe:

Copper pipe shall have the requirements of Type K, ASTM B88. Fittings shall be copper or cast bronze. Silver solder shall be used for joints.

### E. Sprinkler Heads:

Sprinkler heads shall be of the type and model as indicated on drawings.

### F. Backflow Preventer and Enclosure:

Backflow preventer and enclosure shall be of the type, model and size as indicated on drawings.

G. Automatic Control Valves:

Automatic control valves shall be of the make specified, designed to operate with the specified controller with size and model as listed on drawings. Control valve shall be normally closed type and shall have manual bleed nut and manual flow control, single station decoder.

H. Drip Valve Assemblies:

Drip valve assembly shall be of the type, size and style as indicated on the drawings. Strainer shall have 120 mesh nylon screen with 1/2" blow-out. Pressure reducing valve shall have manual adjusting nut, single station decoder.

- I. 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. 3/4" minimum size.  
Fittings - Type and diameter recommended by tubing manufacturer.

J. Drip Emitters and Emitter Tubing:

Drip emitters shall be of the type, style and size as indicated on the drawings. Drip tubing shall conform to ASTM D1248 and ASTM D3350. Capillary tubing shall have 1/8" ID.

K. Drip Line Blow Out Stubs:

Install drip line blow out stubs at all ends of drip tubing.

L. Quick Couplers:

Quick coupler valves shall be of the type, size and style as indicated on the drawings. Quick coupler valves shall be two piece with rubber locking cover.

M. Gate Valves:

Gate valves up to 2-1/2" and larger shall be brass with non-rising stem and I.P.S threads. Gate valves shall be as shown on drawings. Gate valves 3" and larger shall be rubber gasket or mechanical joint. Gate valves shall be as shown on drawings.

N. Automatic Controller (2-Wire):

The automatic controller shall be furnished and located as shown on the plans. The controller shall be of the type, size and model number as shown. Controller shall be equipped with primary line surge protector. Install valve output surge protection arrestors for control wiring and common.

- 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 cable, to be per manufactures recommendations and requirements. Minimum one grounding assembly per every 500' of wire and/or every 10<sup>th</sup> decoder and at all ends of the wire runs.

O. Control Valve Wiring:

- a. Electrical Control Wire - UFUL approved No. 14/14 (2-wire Paige #170116RB or as per manufactures requirements) direct burial copper wire to operate system as designed.
- b. If multiple controllers are utilized, refer to wire routing plan for individual wire runs.
- c. Control Wire connections and splices shall be made with 3M DBR/Y-6 direct bury splice.
- d. Loop five (5) feet minimum of 2-wire cable into all valve boxes.
- e. If multiple controllers are utilized, each controller shall have it's own 2-wire cable run, controllers cannot be connected with same 2-wire run.

P. Valve Boxes:

Carson Valve boxes only, no equals will be accepted. Valve boxes shall be of the type, size and style as indicated on the details. All valve box lids to include locking bolt assemblies. A Carson #910-12 box shall be used for control wire splices. Use one (1) valve box for each valve installed. Where multiple valve boxes occur, arrange in symmetric order and appearance. No valve box extensions will be accepted. On the underside of all control valve boxes shall be markings clearly indicating controller number and valve number.

Q. Booster Pump Assembly:

Booster pump assembly shall be of the type, size and style as indicated on the drawings. The contractor will be responsible for the installation of the pump assembly, concrete pad and all electrical connections. Refer to manufacture of the pump assembly for recommended standards and requirements for installation. Contact manufacture and City for start up assistants.

## PART 3: EXECUTION

### 3.1 INSTALLATION

#### A. Trenching:

1. Trenching and installation of irrigation system shall not commence until final grading has been completed and approved by the owner.
2. Trenches shall be cut to true line and grade, and shall be excavated so that the pipe shall drain uniformly toward the drain valves deemed necessary to properly drain the system. Minimum grade of piping to drain shall be 3"/100'. All debris and rocks shall be removed from trenches. For piping 3" and larger, trench width shall be sufficient for installation of pipe with a clearance of at least 4 inches horizontally on both sides of pipe within trench.
3. Pipe pulling may be used if soil conditions are acceptable to the consultant.
4. Installation Depth of Piping:

Depth of mainline from top of pipe is 24"-30"

Depth of lateral (rotor) from top of pipe is 18"

Depth of lateral (pop-up) from top of pipe is 12"

Depth of shrub (pop-up) from top of pipe is 18"

Depth of wiring – side of mainline

#### B. Plastic Pipe and Fittings:

1. All pipe and fittings shall be installed as per manufacturer's recommendations. No pipe shall be installed in temperatures of 40 degrees F or less. No pipe shall be installed on non-compacted fill dirt. Plastic pipe shall be snaked horizontally in trench and square cut with burrs removed from inside of pipe. Provide for thermal expansion and contraction. For threaded connections, use sealants that are recommended by the manufacturer for use with plastic. Do not use oil based pipe joint compounds. Assemble threaded connections by tightening 1 to 1-1/2 turns beyond finger tight. Keep piping clear of dirt and pipe scale. Keep open ends of assembled piping capped. Teflon tape is to be used on all plastic threaded joints.
2. Solvent weld joints shall be made according to manufacturer's recommendations. Allow joints to set at least 24 hours before pressure is applied to the piping.
3. Thrust blocks shall be installed behind all gasketed fitting inline valves, caps and as indicated on details. Install gasket pipe fittings according to

manufacturer's recommendations. Thrust blocks shall set 72 hours after pouring before pressure is applied to the system. All thrust blocks are to be inspected by the City or consultant prior to being buried.

C. Backfilling:

1. All backfilling shall be done with approved soil, free of any debris including rock and debris 1" in diameter or larger, and shall be puddled and/or mechanically tamped to prevent settling. Backfilling shall not be done with frozen or caked soil. Excess debris encountered during backfill process shall be removed at the contractor's expense. Backfill shall be compacted to 95% standard proctor density (ASTM D698-78). Any backfill soil removed due to unsuitability shall be replaced with new, approved soil at the contractor's expense. Any settling during the warranty period of the backfill material shall be repaired at the contractor's expense, including any damage to other items affecting by the settling.
2. All lateral lines shall be installed in trenches with a minimum of 6" clearance.
3. Do not install lateral lines within 2' of lines of other trades.

D. Installation of Piping Under Paving:

Contractor to coordinate installation of sleeving with other applicable trades. All piping that is to be located under areas where asphalt or concrete paving is to be installed shall at an 18" depth below top of road base. Piping is to be encased in sand 4" on all sides. Add backfill in 6" lifts and use mechanical tamping to reach 95% standard proctor density.

Contractor is to match and install new paving and base with existing paving and base where cutting of paving is necessary for installation of piping. Contractor must obtain written approval from the consultant for the process.

Installation of piping under existing walks is to be done with jacking or boring. Any cracking or breaking of the walk is to be repaired at contractor's expense. Contractor shall repair or replace to its original condition any damage caused by settling of sleeving during the warranty period.

E. Sprinkler Heads:

All sprinkler heads located in turf areas shall be adjusted vertically to be flush with final finish grades. Install heads as per details with spacing according to plans. Install heads on double swing joint assemblies. Angle of nipples relative to lateral lines shall be no more than 45 degrees and no less than 15 degrees. Locate rotary sprinklers 6" (spray heads 3") away from walls, fences and paved areas. Under no circumstances shall the spacing exceed the maximum spacing recommended by the manufacturers.

F. Gate Valves:



Installation of gate valves shall be as indicated on the details.

G. Backflow Preventer and Enclosure:

Installation of backflow preventer shall be as indicated on the details. Install as per local and state codes. The most stringent requirement for backflow prevention shall prevail in case of a conflict. Enclosure to be installed per manufactures standards and requirements.

H. Automatic Control Valves:

Installation of automatic control valves shall be as indicated on the details. All control valves shall be installed as close as possible to the locations as shown on plans. 2-wire decoders to be installed per manufactures recommendations.

I. Drip Valve Assemblies:

Installation of drip valve assemblies shall be as indicated on the details.

J. Drip Emitters and Tubing:

Installation of drip emitters and tubing shall be as indicated on the details. Drip tubing is to be installed at a depth of 4" below top of grade. In this case, top of grade does not include mulch or rock layer. Drip line blow out stubs are to be installed at all ends of drip tubings. Install drip tubing in turf areas as lateral piping.

K. Quick Coupling Valves:

All quick coupling valves shall be installed as double swing joint assemblies of schedule 45 PVC. Angle of nipple relative to mainline shall be no more than 45 degrees and no less than 15 degrees. Install as per detail.

L. Automatic Controller:

1. Automatic controller shall be installed as per manufacturer's recommendations and/or irrigation details. Each controller shall have its own separate ground wire and reduced, laminated as-built drawing installed in the door. Controller charts shall be legible and color coded to show valve numbers and their respective zones. Charts are to be hermetically sealed between two layers of 20 mil. Thick plastic sheets and approved prior to final acceptance.
2. All work performed as electrical installation shall conform to applicable codes. All high voltage electrical work shall be performed by a licensed electrician. The contractor shall be responsible for the electrical connection of the controller with the metered electrical line at the base of the controller as provided by the owner.
3. Install one valve output surge protection arrestor on each control and common wire.
4. Install a circuit breaker and electrical on/off switch for each controller.

M. Control Wiring:

1. Low Voltage Wiring:

The wire paths shall be twisted pair, solid-core, color-coded red/blue pairs with each conductor in a polyethylene jacket suitable for direct burial. The two-wire paths shall be UFUL approved No. 14/14 (2-wire Paige #170116RB or 12 AWG (2mm) conductors for extended range (over 10,000 ft./3km, up to 15,000 ft./4.5km), or as per manufactures requirements). 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. For example, a path comprised of No.14/14 (rated for 10,000ft./3km) could extend 5000 ft./1.5km to a "tee" splice, and each arm of the tee could extend an additional 5000 ft./1.5km. The total wire connected would equal 15,000 ft./4.5km, but the distance from the controller, to the end of each run, would be 10,000ft./3km or less, meeting the specification. All wire splices must be made in a valve box with DBR-6 or equal direct-burial waterproof connectors.

2. High Voltage Wiring for Automatic Controller:

- a. Provide 120 volt power connection to automatic controller.
- b. All electric work shall conform to local codes, ordinances, and authorities having jurisdiction. All high voltage electrical work shall be performed by licensed electrician.

N. Drain Valves:

Manual drain valves shall be installed as per details. Contractor shall supply, locate and install drain valves so as to drain entire mainline.

O. Booster Pump Assembly:

Installation of booster pump assembly shall be as indicated on the details and per manufacture recommended standards and requirements. The contractor will be responsible for the installation of the pump assembly, concrete pad and all electrical connections. Contact manufacture and City for start up assistants.

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 barrier rocks.
- 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. Shall be approximately 1-1/2 ton (3'x3'x5'). 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 RELATED DOCUMENTS: Drawings and general provisions of the Construction Contract, and Division -1 Specification section, apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of installing the specified site furnishings, and shelters..
- 1.3 SUBMITTALS: As specified in Section 01300.
- A. Submit product data for all manufactured items.
  - B. In order to be considered, any alternate to the specified items must meet all specifications of the specified items, including but not limited to color, materials, and the individual components. In addition, overall design and aesthetics will be considered.
  - C. Submit all color samples for shelters, and all site furniture and shelters.
- 1.4 RELATED WORK:
- A. Concrete Walks, Curbs & Miscellaneous Flatwork - Section 02520.

**PART 2: PRODUCTS**

- 2.1 BENCHES:
- Type A: Shall be model #TG1-1000-A-PF Bench, color to be "bright green" Pantone color PMS 375 as manufactured by Sitescape Distributed by GR Marolt & Associates LLC. 303-762-1090.
- Type B: Shall be model #MF2200 Bench with straight back, color 93-brown, as manufactured by Wausau Tile. Distributed locally by Recreation Plus, Ltd., (303) 278-1455.
- 2.2 TRASH RECEPTACLES: Shall be model #MF3202, surface mount Trash Receptacle. Color to be 93-brown as manufactured by Wausau Tile. Distributed locally by Recreation Plus, Ltd., (303) 278-1455.
- 2.4 PICNIC TABLES: Shall be model #WXT-CB-HU Pilot rock 8' picnic table. Table top and seats to be thermoplastic coated color "brown", table top and seat pattern to be H-type perforated steel. Steel frame to be powder coated color "black". To include surface mounted adapters – (4) per table. Distributed by RJThomas MFG. Company. (800)-762-5002.
- 2.5 BIKE RACKS: Shall be model #BRBC-8 with surface mount adapters, color to be

powder coated "brown" as manufactured by Paris Equipment Manufacturing. Distributed locally by Recreation Plus, Ltd., (303) 278-1455.

- 2.6 GRILLS: Shall be Surface mounted BBQ Model # 1140-10, Double Grill 32"x20", manufactured by PW Athletic. Distributed locally by Recreation Plus, Ltd., (303) 278-1455.

2.7.0 PICNIC SHELTERS:

A. Large shelter shall be model #MH22x45M-P4-45-90-0 shade shelter manufactured by Icon Recreation Systems. Post and Frame to be powder coat color: "Dow Black", roof to be cardinal powder coat color: "Dark Bronze" for Cardinal Powder coating contact 303-286-1876. Shelter as Distributed locally by Recreation Plus, Ltd., (303) 278-1455.

B. Small shelter shall be model #SQ14M-P6 shade shelter manufactured by Icon Recreation Systems. Post and Frame to be powder coat color: "Dow Black", roof to be cardinal powder coat color: "Dark Bronze" for Cardinal Powder coating contact 303-286-1876. Shelter as Distributed locally by Recreation Plus, Ltd., (303) 278-1455.

PART 3: EXECUTION

3.1 SITE FURNISHINGS AND EQUIPMENT:

- A. Install per manufacturer's specifications and directions.

END OF SECTION 02860



**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**

Vitriturf Systems as distributed by Rocky Mountain Recreation, Inc. 303-783-1452 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 1/2" 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 surface, underdrain, mats, fitness equipment and play equipment.
- 1.03 SUBMITTALS: As specified in Section 01300.
- A. Submit product data for all manufactured items.
  - B. Submit 1 cubic foot sample of playground surface material.
  - C. Submit color samples for all play equipment.
- 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 and Fitness 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 and Fitness Equipment manufacturer, model and color
- 2.02 Playground Surface:
- 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.
  - B. Testing of Engineered Wood Fiber in accordance with ASTM F 1292 must show G-max values of less than 155G for the 8" thick system, or 120G for the 12" system at 12' drop heights, and HIC values of less than 1,000 for both new and 12-year-old material.

- C. Supplier must provide test results for the Engineered Wood Fiber in accordance with ASTM F 2075 Specification for Engineered Wood Fiber for Use as Playground Safety Surface Under and Around Playground Equipment.
- D. Supplier must provide test results in accordance with ASTM F 1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- E. Supplier must certify that the surface meets the intent of the Americans with Disabilities Act ( ADA ).

2.03 Underdrain System:

- A. Underdrain system shall be Fiber Drain by Fibar Group LLC, Armonk, NY 800-342-2721 or approved equal.
- B. Provide Fibar Drain 6' apart over entire play area and overlay with geotextile fabric.

2.04 Mats:

- A. Provide one (1) FibarMat by Fibar Group LLC, Armonk, NY 800-342-2721 or approved equal, (minimum size: 36" x 36"x 1.5" with a 2" beveled edge on all sides) under each swing seat, tire swing, slide exit, and sliding pole. Double and triple slides may require multiple FibarMats.

### PART 3 - EXECUTION

3.01 Play and Fitness 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.

3.02 Playground Surface:

- A. Install Fibar safety surfacing, mats and underdrain system as per manufacturer's recommendations.
- B. Provide safety surface immediately after installing playground equipment. Avoid contaminating Engineered Wood Fiber with sand, gravel, mud or native soils.

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 other Division - 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section includes native grass seeding, mulching, netting if applicable, and maintenance of the seeded areas until Final Acceptance.
- 1.3 RELATED SECTIONS:
  - A. Watering - Section 02233
  - B. Irrigation System - Section 02810
  - C. Soil Preparation - Section 02920
  - D. Topsoil – Section 02925
  - E. Trees and Shrubs - Section 02950
- 1.4 REFERENCES:
  - A. Reference Standards: Comply with U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and be equal or better in quality than standards for certified seed.
- 1.5 SUBMITTALS:
  - A. Quality Control Submittals:
    - 1. Certificates: State, Federal or other inspection certificates shall accompany the invoice for materials showing source or origin. Submit to Owner's Representative prior to acceptance of the material.
  - B. Contract Closeout Submittals:
    - 1. Operating and Maintenance Data: At completion of work, submit 3 copies in accordance with Section 01700. Include directions for irrigation, mowing and spraying as required for continued and proper maintenance through full growing season and dormant period.
    - 2. Warranty for Native Seed in Irrigated Areas: At completion of work, furnish written warranty to Owner based upon requirements as specified.
- 1.6 QUALITY ASSURANCE:
  - A. Source Quality Control:

1. Seed Materials: Subject to inspection and acceptance. Owner's Representative reserves the right to reject at any time or place prior to acceptance, any work and seed which in the Owner's Representative's opinion fails to meet specification requirements.
  2. Inspection: Primarily for quality; however, other requirements are not waived even though visual inspection results in acceptance.
  3. Inspection will be made periodically during seeding, at completion of seeding and at end of warranty period by Owner's Representative.
- B. Testing Requirements: Seed and seed labels shall conform to current State and Federal regulations and be subject to testing provisions of the Association of Official Seed Analysis.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in sealed standard containers stating correct name and composition on the outside of the container. Seed damaged in transit or storage will not be accepted.
- B. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened container bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark and conformance to state law, and bearing name and warranty of producer.
- C. Material will be inspected upon arrival at project site.
- D. Immediately remove unacceptable material from job site.

#### 1.8 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Vehicular accessibility on site shall be as directed by Owner's Representative. Repair damage to prepared ground and surfaces, caused by vehicular movement during work under this section, to original condition at no additional cost to the City.
- B. Environmental Conditions: Do not drill or sow seed during windy weather or when ground is frozen or otherwise untillable.

#### 1.9 WARRANTY:

- A. Warranty for Native Seed in Irrigated Areas: Warrant areas in seed to be in a healthy, vigorous growing condition, and for consistency and completion of coverage for a period of one year from date of final acceptance as a full stand of grass. After time of seed germination, re-seed any spots where seed has not germinated within the total seeded area. Continue this procedure until a successful stand of grass is growing and accepted by the Owner's Representative.

1. During the original warranty period, reseed at once with comparable blend/mix, those areas that have failed to achieve a stand of grass or which in the Owner's Representative's opinion are unhealthy.
2. Reseeding will not be required in any season definitely unfavorable for seeding.
3. Reseed in a manner to achieve quality as originally specified.

B. Warranty for Native Seed in Unirrigated Areas: No warranty will be required.

#### 1.10 MAINTENANCE:

- A. General: The maintenance period shall begin immediately after each area is seeded and continue until Final Acceptance of entire project or a minimum of 90 days, whichever is longer. Final Acceptance of seeded areas will not be given until Owner's Representative is satisfied with germination and a full stand of grass is in a vigorous growing condition, with consistency and completion of coverage. During this time, 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. After Final Acceptance, maintenance shall become the responsibility of the City.
- B. Irrigated Areas (if applicable): The seeded areas shall be accepted on the basis of having a uniform plant growth over the entire seeded area. Two (2) months after seeding, the seeded areas shall be reviewed by the Owner's Representative and the Contractor. Any areas (as determined by the Owner's Representative) where the seed has failed to germinate shall be reseeded and raked to cover the seed. In any area where the seed has failed to grow, reseeding shall be at the Contractor's expense until grass is established and accepted. Acceptable uniform plant growth shall be defined as when scattered bare spots, not greater than 12 square inches, do not exceed 5% of the seeded area.
- C. Unirrigated Areas: The seeded areas shall be accepted on the basis of showing evidence of growth of specified seed material over the entire seeded area.
- D. Materials: Conform to specifications or otherwise be acceptable to the City.
- E. Mowing and Trimming: Mow native/adapted grasses after the grass has gone to seed, cutting back to not less than 4" height. Remove clippings from adjacent pavement or irrigated turf areas.
- F. Weed Control: Control annual weeds by mowing. Control perennial weeds through use of selective herbicides approved by the Owner's Representative.

## PART 2: PRODUCTS

### 2.1 MATERIALS:

- A. Native Seed Mix: Refer to plans.
- B. Mulch: Wood cellulose fiber suitable for hydromulching, in accordance with CDOT 213.02
- C. Fertilizer: Inorganic mixture with following chemical composition: 20-5-10 with 50% sulfur coated urea (no iron), or as recommended by testing lab.
- D. Water: Free of substances harmful to seed growth. Water will be furnished by the Contractor, available through quick coupler or previously installed automatic irrigation system. Hoses and other watering equipment to be furnished by Contractor.
- E. Tackifier: Shall meet the requirements of CDOT 213.02.
- F. Erosion Control Blanket: Greenfix America 100% California Straw Erosion Control Blanket, supplied by Revex, Inc., 8941 Woodland Rd. Longmont, CO 80503, Ph: 1-800-666-4050, or approved substitution.

## PART 3: EXECUTION

### 3.1 EXAMINATION:

- A. Verify that existing site conditions are as specified and indicated before beginning work under this section.
  - 1. Layout: Verify layout of seeding areas as indicated prior to starting seeding operations.
  - 2. Grades: Inspect to verify that fine grading is within 0.1 foot of grades specified and indicated.
- B. Unsatisfactory Conditions: Report in writing to General Contractor with a copy to the Owner's Representative.
- C. Acceptance: 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, fences, pavements and other site improvements damaged by operations under this section.
  - 2. Pay for repairs made by Contractor(s) designated by the City.

3. Identify prepared seeding areas requiring protection and erect barriers for proper protection and traffic control.
- B. Erosion Control: Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited materials on the site throughout the duration of work.
- C. Seeding Areas: Remove weeds, debris and rocks larger than 1" which may hinder seeding or subsequent operations. Dispose of accumulated debris at direction of the Owner's Representative.
- D. Fine Grading: Perform as required to maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc., and to provide smooth well-contoured surface prior to proceeding. A firm weed-free seed bed is required. Tolerance:  $\pm 0.1$  foot.

### 3.3 SEEDING:

- A. General: Accomplish seeding by a rangeland grass drill with double disk openers and depth bands. Drill in a manner such that after surface is raked and rolled, seed shall have 1/4" to 1/2" of cover. Any furrows left by drill seeding shall be rolled to a smooth surface.
- B. In areas too small or steep to operate a drill and if approved by the Owner's Representative, seeding may be accomplished by broadcast or hydraulic type seeders at twice the rate specified, at no additional cost to the project. seed by broadcasting or hydroseeding. Broadcast seed shall be raked in at least 1/4 inch.
- C. Seeding Seasons
  1. Irrigated Areas:  
Spring Seeding: Spring thaw to June 30  
Fall Seeding: September 1 to consistent ground freeze
  2. Unirrigated Areas:  
Spring Seeding: Spring thaw to June 1  
Fall Seeding: September 1 to consistent ground freeze

### 3.4 MULCHING:

- A. Mulch Application: Utilize an approved hydromulcher to apply cellulose fiber at a rate of 2000 lbs. per acre.
- B. Mulching shall not be done in the presence of free surface water resulting from rains, melting snow or other causes.
- C. Areas not properly mulched, or damaged due to the Contractor's negligence, shall be repaired and remulched in an acceptable manner at the Contractor's expense. Mulching removed by wind prior to acceptance shall be re-established by the Contractor at his own expense.

- D. The seeded area shall be mulched within 8 hours after seeding. Areas not mulched within 24 hours after seeding must be re-seeded with the specified seed mix at the Contractor's expense.
- E. Contractor shall remove all hydromulch from plant materials, fences, paved areas and other objects as directed by Construction Manager.

3.5 FERTILIZING:

- A. Distribute 20-5-10 fertilizer uniformly at the rate of 1 lb. actual nitrogen per 1,000 sq.ft. or 5 lbs of material per 1,000 sq.ft. 45 days after planting of seed and every 30 days thereafter until Final Acceptance of project.

3.6 EROSION CONTROL BLANKET: Install erosion control blanket on slopes exceeding 4:1 and in swales or other areas of concentrated runoff. Install in accordance with manufacturer's instructions.

3.7 CLEANING: Remove debris and excess materials from site. Clean paved and finished areas soiled as a result from work under this section, in accordance with direction given by the Owner's Representative. Clean out drainage inlet structures.

3.8 PROTECTION: Provide and install barriers as required and as directed by the Owner's Representative to protect seeded areas from damage from pedestrian and vehicular traffic. Contractor is not responsible for malicious destruction of seeding caused by others.

END OF SECTION 02933



**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 2½-2¾" 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 1/2". 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:  $\pm 0.04$  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  $\frac{1}{2}$  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  $\frac{1}{2}$  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-mm) 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, seeded areas, trees, shrubs, ground cover, mulch, cobble, 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
  - D. Native Seeding and Mulching – Section 02933
- 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 (seeded areas, tree and shrub care, mulching, winter watering, sweeping, etc.) shall extend one (1) year after final acceptance of the landscape portion of the project. Maintenance of seeded turf areas shall last through a minimum of one (1) year full growing season.

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 SEEDED AREAS:

- A. General: The maintenance period shall begin immediately after each area is seeded 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. At the beginning of the maintenance period, fence the soccer fields, and the non-fenced ballfield off with construction barrier fencing.
- C. Materials: Conform to specifications or otherwise be acceptable to Owner.
- D. Watering: Water seeded 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. Native and adapted grasses should not require watering once fully established. The source of water for this park is reclaimed water. The Contractor shall report to the City issues with salinity that might affect plant growth.
- E. Reseeding: In irrigated native seed areas larger than 1 sq.ft. in which no stand of grass is established, reseed and water until stand of grass is successfully established.
- F. Fertilization: Native Seed/Dryland Grasses - None required.
- G. 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.
- H. 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.
- I. 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.
- J. Weed Control: As required, using selective herbicides approved by Owner's Representative.
- K. 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

**PART 1: GENERAL**

1-1 DESCRIPTION: The work of this section consists of furnishing and installing all miscellaneous metalwork.

1-2 RELATED WORK SPECIFIED ELSEWHERE:

Definition of Bid Items - Section 01150  
Cast-in-Place Concrete - Section 03300  
Painting - Section 09900

1-3 QUALITY ASSURANCE: American Society for Testing and Materials (ASTM), American Institute of Steel Construction (AISC), American Welding Society (AWS).

1-4 SUBMITTALS:

A. Shop Drawings and Erection Drawings. Show materials and specifications list, construction and fabrication details, layout and erection diagrams, and method of anchorage to adjacent construction. Give location, type, size and extent of welding and bolted connections and clearly distinguish between shop and field connections. Prior to submittal, coordinate shop drawings with related trades to insure proper mating of assemblies. Work shall conform to approved shop drawings.

1. Catalog work sheets showing illustrated cuts of item to be furnished, scale, details, and dimensions may be submitted for standard manufactured items.

2. Where items must fit and coordinate with finished surfaces or constructed spaces, take measurements at site and not from drawings. Where concrete or other materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work. Where welded connectors or concrete inserts are required to receive work, shop drawings shall show exact locations required, and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.

**PART 2: MATERIALS**

2-1 STRUCTURAL STEEL: Structural steel angles, plates and bars shall meet the requirements of the ASTM Standard Specification for Structural Steel ANSI/ASTM A36 ( $f_y = 36,000$  psi) and all square and rectangular structural tubing shall conform to ASTM Serial Designation A500, Grade B ( $f_y = 46,000$  psi). Items covered in this designation include handrails, handrail post attachments and miscellaneous items shown on the drawings.

2-2 PIPE RAILINGS: Where the railing design utilizes steel pipe, the steel pipe shall conform to ASTM Serial Designation A53, Type E, Grade B or ASTM A53, Type S, Grade B.

2-3     **HARDWARE:** All hardware including nuts, bolts, and washers shall be cadmium-plated, and shall conform to ASTM A307, or stainless steel as indicated.

2-4     **EXPANSION BOLTS:** Expansion bolts and anchors shall be stainless steel. Where expansion bolts are used to fasten to concrete, they shall be approved equal to Hilti "KWIK-BOLT", Molly Parabolt or Phillips Redhead Expansion Anchors.

### **PART 3: EXECUTION**

#### **3-1     GENERAL FABRICATION AND INSTALLATION REQUIREMENTS:**

A.     **Quality and Standards.** All fabrication shall be equal to good practice in modern fabrication shop. Ferrous metals shall be thoroughly cleaned of all loose scale and rust before being fabricated. Finished members shall be free of twists, bends or open joints, and shall present a neat workmanlike appearance when completed. Conform with A.W.S. and A.I.S.C. specifications and codes.

B.     **Welding.** All welding shall be done in accordance with the "Code for Arc and Gas Welding in Building Construction", AWS D1.0. Welders shall be qualified by tests in accordance with AWS B3.0.

C.     **Fabrication and Installation.** Form and fabricate to meet required conditions. Include clips, straps, bolts, screws, and other fastenings necessary to secure the work. Accurately make and tightly fit joints and inner-sections in true planes with adequate secure fastenings. All metal work shall be erected plumb, true on line, and in its designated location. Field welds on exposed surface shall be ground and finished smooth. After installation, all work shall be left in a neat and clean condition, ready for final painting or coating.

1.     Coordinate work of this Section with related trades. Particular attention is required for items to be embedded in concrete work. Provide all punchings and drillings indicated or required for attachment of other work to that of this Section. Prior to fabrication and installation of railing, conduct field measurements to determine the locations and spacing of all embedded plates.

2.     **Compliance with Safety Requirements.** Dimensions required for the fabrication and installation of handrails which are not shown on the drawings, shall conform to the applicable requirements of OSHA Occupational Safety and Health Standards.

D.     **Protection.** Protect and repair adjacent surfaces and areas which may become damaged as a result of work of this Section. Protect work until completion and final acceptance of project by Owner. Repair or replace all damaged or defective work to original specified condition, at no additional cost to the Owner.

1.     **Protection of Finished Deck.** Exercise reasonable precaution to protect finished deck surfaces and adjacent work from damage. Decks shall not be overloaded. Mobile equipment placed directly on decks shall use pads of timber or other material for cushioning.



2. Where welding is done in proximity to finished surfaces, such surfaces shall be protected from damage due to weld sparks, spatter, or tramp metal.

E. Painting and Coating. All ferrous metals, except galvanized metals, shall be given one or more shop coats of paint. Do not paint areas to be field welded. After erection, all areas where the shop coats have been rubbed off or omitted, and all field bolting and welding shall be painted, as specified.

3-2 HANDLING: Care shall be exercised in the handling and shipping of all miscellaneous metalwork to prevent bending and distortion, scratching, and exposure to the elements.

3-3 PAINTING: See Section 09900.

END OF SECTION

**PART 1: GENERAL**

1-1 DESCRIPTION: The work of this section consists of furnishing all materials, equipment, supplies, and accessories required and of performing all operations needed in connection with the painting of the various parts of the work.

No paint shall be applied to permanently finished equipment which is considered acceptable by the Engineer.

1-2 QUALITY ASSURANCE: National Association of Corrosion Engineers (NACE); Steel Structures Painting Council (SSPC).

1-3 MATERIALS SUBMITTAL: The paints to be used on the various substrate materials shall be of the best quality commercial and industrial grades and shall be manufactured by nationally known and approved paint manufacturers. In accordance with Section 01300, submit a minimum of 5 copies of a Painting Schedule. This schedule shall give the information listed below for all the paints and stains he intends to use. This shall be done for substituted paints as well as those listed in the painting systems.

- A. Name of the manufacturer of the paint;
- B. Type of paint (chemical composition type such as alkyd, epoxy, vinyl, etc.);
- C. Trade name and number of each specific paint;
- D. Number of coats to be applied for each paint;
- E. Dry film thickness to be achieved for each coat;
- F. Spreading rate at which each coat will be applied; and
- G. Color name and number accompanied by color chart.
- H. Results of accepted tests (ASTM, Fed) for hardness, abrasion, impact, humidity etc.

1-4 PAINTING SCHEDULE: A tabular summary of the only items to be painted and stained under this contract are listed below. The color and painting system to be used is included in this table. The general painting systems are described in Section 2-2, (some of which may not be used).

	<u>Item</u>	<u>Color</u>	<u>Painting System</u>
1.	Handrail, Posts and Attachments	Tnemec 42BR Chocolate	B3 described below
2.	Other Miscellaneous Metalwork	As Approved	As Approved
3.	Other Furnishings Painted by Manufacturer	As Approved	As Approved

**PART 2: MATERIALS**

2-1 GENERAL:

A. Surfaces to receive paint protective coating materials as scheduled or specified in this Section shall be coated in conformance with the applicable coating systems specified. So far as possible, all paint and coating materials shall be provided by a single source supplier.

B. Products shall be standard for recognized manufacturer engaged in production of such materials for essentially identical or similar applications in the water and wastewater treatment industry.

C. Only compatible materials shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to approval of the Owner, a compatible barrier coat shall be applied between all existing prime coat and subsequent field coats to ensure compatibility.

## 2-2 PAINTING SYSTEMS:

The following are the general painting systems. Painting Schedule and Coatings Materials List to be submitted by the Contractor shall contain painting systems similar and equal to those listed below, for each substrate category.

A. Concrete, Concrete Block, and Brick Masonry — Not Applicable

B. Steel, Structural and Plate.

**System B3.** Interior/Exterior Steel Railings, Doors, Miscellaneous Metalwork - Not Submerged but Exposed to Moist Atmosphere and/or Sunlight and Weather.

Paint Type: Aliphatic Polyurethane semi-gloss Enamel over Polyamide Epoxy.

Surface Preparation: Remove all grease, oils and contaminants. Remove all weld splatters and grind rough and sharp welds to smooth rounded contour and blast clean to near-white metal finish (NACE No. 2). Surface to be dry.

Manufacturer: Tnemec

<u>Paint Name and No.</u>	<u>Dry Mil Thickness</u>	<u>Spreading Rate</u>
Coat No. 1: Hi-Build Epoxoline 66	5 plus or minus 1	180 sq.ft./gal.
Coat No. 2: Endura-Shield Series 71	1.5 to 2.5	433 sq.ft./gal.

## **PART 3: EXECUTION**

3-1 SURFACE PREPARATION: Surface preparation of each substrate material shall be as described in the painting systems breakdown and completed prior to beginning the painting operation.

All structural steel, metalwork, piping, and other metal surfaces to be painted shall be thoroughly cleaned of grease, oil, and contaminants by the use of solvents recommended by the manufacturer of the paint which will be applied. When blasting is required in the surface preparation of a painting system, the blasting shall be performed within conformance of the "Standard for Surfaces of New

Steel Airblast Cleaned with Sand Abrasive" as written by the National Association of Corrosion Engineers, 2400 West Loop South, Houston, Texas.

Acceptance of final blasted steel surfaces will be made by the Engineer utilizing the visual standards test method No. NACE TM-01-70 to visually compare the specified NACE surface with the steel actually being blasted. NACE standards of quality are called out for each painting system where blasting is required as a portion of the surface preparation. The Steel Structures Painting Council (SSPC) through its specifications recognizes several methods of surface preparation as being equivalent to the NACE standards. The NACE and SSPC standards referred to are:

NACE No. 1:	SSPC-SP-5	White Metal Blast
NACE No. 2:	SSPC-SP-10	Near-White Blast
NACE No. 3:	SSPC-SP-6	Commercial Blast
NACE No. 4:	SSPC-PS-7	Brush-Off Blast

The Contractor shall continue to blast the surface of the steel until such time as the Engineer is satisfied that the steel being blasted is of a quality equal to the specified NACE grade.

All dust created by the blasting operation must be removed immediately after the blasting operation by vacuuming. The first coat of paint should be applied to the steel as soon as possible and always the same day that the blasting is done.

3-2 MANUFACTURER'S RECOMMENDATIONS: All paint and stain shall be mixed and applied with strict conformance to the paint manufacturer's directions, which will take precedence over this specification. Selection of paints to be applied to each specific substrate material shall be verified with the paint manufacturer and his approval obtained.

3-3 WRITTEN APPROVAL OF COATINGS MANUFACTURER: For all coatings to be applied to new and existing concrete, concrete block, plaster and asbestos cement paneling, written approval shall be obtained from the coatings manufacturer for the items listed below. Six copies of this written approval shall be submitted to the Engineer after the coatings manufacturer has personally inspected each of the following conditions:

- A. Final surface preparation of all surfaces prior to coating application.
- B. Sequencing of application of coatings as to when each surface of each wall and ceiling shall be coated.

This is intended to keep the coatings manufacturer informed of the status of the job at all times so that he can govern the application process to be assured that all coatings are applied within his recommendations.

3-4 SHOP APPLIED PRIME COAT: Any prime coat which shall be shop applied shall meet the requirement stated in this specification. The manufacturers of such items shall submit the information required in paragraph 1-3 of this section, for each manufactured item. The Contractor shall coordinate shop prime coat painting and finish coat painting to ensure compatibility.

3-5 APPLICATION METHODS: Exterior painting shall not be done during damp or freezing weather. Paint manufacturer's directions for cold weather applications shall be followed explicitly.

All fresh work shall be protected from damage. For interior work, the temperature shall not be allowed to fall below 60 degrees F. while paint is being applied, or while it is drying.

All paint shall be evenly applied in a uniform coat. The finished painting shall show no drops, runs, or sagging of materials. Edges, corners, crevices and joints shall receive special attention to ensure that they have been thoroughly cleaned and that they receive an adequate thickness of paint. Accordingly, in corners and such location apply by brush before applying coats called for herein or as approved to prevent bridging.

In addition to preparatory sanding, each coat, except the last, shall be fine-sanded. Avoid cross scratches and swirls.

Each coat of paint shall be given at least 48 hours to dry before the next coat is applied, unless otherwise directed by the manufacturer's instructions.

Any walls that are to have dampproofing applied thereto, will be marked with chalk lines to the approval of the Engineer to establish a cleancut line at which the dampproofing stops.

All metalwork which has been shop-painted with rust-inhibitive prime coat shall be handled with care to preserve such coating. Before painting, the Contractor shall repaint all defective or damaged areas with an approved prime coat after cleaning and removing rust.

On metal surfaces, each coat of paint shall be applied at the rate specified to achieve the average dry mil thickness required. Allowable maximum variations from the average are given; however, the average must be achieved. Deficiencies in the average or in the maximum variation must be corrected. On concrete and/or masonry, application rates will vary according to surface texture. However, in no case shall the stated spreading rate be exceeded. On porous surfaces, a protective and decorative finish shall be achieved. Deficiencies in film thickness shall be corrected by the application of an additional coat(s) of paint. Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times will be necessary. Additional coats of paint shall not be applied, nor shall units be returned to service until paints are thoroughly dry.

Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, shall be allowed, and all such thinning shall be done strictly in accordance with the manufacturer's instructions, as well as with the full knowledge and approval of the Engineer. All coats will be of the same color except where specified differently.

Paint both faces and all edges of doors which require painting. Doors between rooms having different finishes shall have edges finished to match the room the door opens into.

Knife-putty nail holes upon the priming coat with putty tinted to color of finished work. Putty full and flush with surrounding surfaces; thumb-puttying will not be permitted. Permit to dry and harden before applying next coat.

3-6 INSPECTION: The Engineer may call for any standard test methods he desires and the Contractor will provide such devices and approved experts to execute such testing. He will make all repairs needed for destructive test methods and will repair inadequate painting.

3-7 CLEAN-UP/TOUCH-UP WORK: Upon completion, carefully remove all splatterings of paint material from adjoining work, glass, plumbing fixtures, trim and concrete surfaces. A detailed inspection of paint work shall be made and disfigured portions thereof shall be satisfactorily touched up or refinished to produce an acceptable job. All disused implements of service, rubbish and debris, resulting from the work shall be removed from the premises and the entire project left in a neat, clean, and acceptable condition.

END OF SECTION

**PART 1 GENERAL****1.01 PROVISIONS**

- A. Drawings, general provisions of the Contract, any General and Supplementary Conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

**1.02 DESCRIPTION**

- A. A new neighborhood park.
- B. Furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on drawings and/or listed below and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete testing of the system. It is the intent of Drawings and Specifications that all systems be complete and ready for operation.

**1.03 WORK INCLUDED**

- A. A new single phase electrical service, utility meter, distribution, exterior lighting and lighting control.
- B. Certain labor, materials and/or equipment may be furnished under other sections, or by Owner. When such is the case, extent, source and description of these items shall be indicated on drawings or described herein. Unless otherwise noted, all labor, materials, and/or equipment for complete installation of electrical work shall be provided under this Division.

**1.04 DEFINITIONS**

- A. Instructions such as "Provide the outlets" shall mean the same as though the words "This contractor shall" preceded each such instruction. "Provide" shall mean "Furnish and Install." Where the words "Accepted or Acceptable" are used, such "Accepted" or "Acceptable" action by the Engineer denotes that the work or equipment item is in conformance with the design concept of the project and, in general, complies with information in the Contract Documents.

**1.05 STANDARDS FOR MATERIALS**

- A. All materials shall conform with the current applicable industry standards and the University of Colorado Standards. Workmanship and neat appearance shall be as important as electrical and mechanical operation. Defective or damaged materials shall be replaced or repaired prior to final acceptance in a manner meeting approval of Engineer and at no additional cost to Owner.
- B. The latest editions of the following standards are minimum requirements.

1. Underwriters' Laboratories, Inc. (UL)
2. National Electrical Manufacturer's Association (NEMA)
3. American National Standards Institute (ANSI)
4. Insulated Cable Engineer's Association (ICEA)
5. Institute of Electrical and Electronic Engineers (IEEE)

#### 1.06 SUBSTITUTION OF EQUIPMENT AND MATERIALS

- A. No substitutions of equipment without written approval from the Engineer in the form of an addenda, submittals shall be received by the Engineer a minimum of 7 calendar days prior to the bid date.

#### 1.07 CODE COMPLIANCE

- A. All work and materials shall comply with latest rules, codes and regulations, including but not limited to the following: CU Standards, OSHA, National Fire Codes of National Fire Protection Association (NFPA), 2011 National Electrical Code and all other applicable State and local laws and regulations.
- B. Code compliance is mandatory. The Drawings and Specifications shall not permit work that does not conform to these codes.
- C. No work shall be concealed until after inspection and approval by proper authorities and design engineer. If work is concealed without inspection and approval, Contractor shall be responsible for all work required to expose and restore the concealed in addition to all required modifications.

#### 1.08 DRAWINGS

- A. Drawings indicate general arrangement of circuits and outlets, locations of switches, panelboards and other work. Drawings and specifications are complementary each to the other, and what is called for by one shall be binding as if called for by both. Data presented on drawings is as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc. to suit field conditions is directed. Review all drawings and adjust all work to conform to all conditions shown therein. Discrepancies between different drawings or between drawings and specifications or regulations and codes governing installation shall be brought to the attention of the Engineer.

### PART 2 - PRODUCTS

#### 2.01 EQUIPMENT AND MATERIALS

- A. All equipment and materials installed shall be new and UL approved unless otherwise specified.
- B. All major equipment components shall have manufacturer's name, address, model



number and serial number permanently attached in a conspicuous location.

### PART 3 - EXECUTION

#### 3.01 CONDITIONS AT SITE

- A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions, and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
- B. Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to Owner to complete satisfaction of Engineer.

#### 3.02 LICENSE, FEES, AND PERMITS

- A. Arrange for required inspections for all license, permit and inspections. Furnish a certificate of final inspections and approval from local authority having jurisdiction over electrical installation.

#### 3.03 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

- A. Only quality workmanship will be accepted. Haphazard or poor installation practice will be cause for rejection of work. A journeyman to apprentice ratio of 1:3 must be maintained.
- B. Provide foreman in charge of this work at all times.
- C. Contractor must have been in business under the same name for a minimum of 5 years and have a manned office, full time. Also provide a current and complete financial statement for review.
- D. Where specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall at all times be kept in job superintendent's office and shall be available to Engineer's and/or Owner's representative.

#### 3.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Division 1.
- B. Prior to submission, shop drawings, material lists and catalog cuts or manufacturer's printed data shall be thoroughly checked for compliance with contract requirements, compatibility with equipment being furnished by the Contractor or Owner, accuracy of dimensions, coordination with work of other trades, and conformance with sound and safe practice as to erection of installation. Each submittal shall bear Contractor's signed statement evidencing such checking.
- C. Clearly mark each shop drawing as follows for purposes of identification:

Equipment Identification Used on Contract Drawings

Date  
Name of Project  
Branch of Work  
Architect/Engineer's Name  
Contractor's Name

- D. Clearly mark printed material, catalog cuts, pamphlets or specification sheets, and shop drawings with the same designation shown on the contract document schedules. Identify specific item proposed, showing catalog number, recess openings, dimensions, capacities, electrical characteristics, etc. Submittals which are incomplete will be returned to the Contractor without review.
- E. Contractor agrees that submittals processed by the Architect/Engineer are not change orders; that the purpose of submittals is to demonstrate to the Architect/Engineer that the Contractor understands the design concept; and that the Contractor demonstrates this understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.
- F. Contractor shall be responsible for dimensions (which he shall confirm and correlate at the job site), fabrication processes and techniques of construction, and coordination of his work with that of other trades. The Contractor shall check and verify all measurements and review shop drawings before submitting them. If any deviations from the specified requirements for any item of material or equipment exist, such deviation shall be expressly stated in writing and incorporated with the submittal.
- G. Maintain one copy of shop drawings at the project field office until completion of the project, and make this copy available, upon request, to representatives of the Architect/Engineer and Owner.
- H. No equipment or materials shall be installed or stored at the jobsite until submittals for such equipment or materials have been given review action permitting their use.
- I. Shop drawings and manufacturer's published data shall be submitted for:
  - Lighting fixtures (catalog cuts)
  - Panelboards
  - Meter pedestal
  - Contactors
  - Time clock
  - Photocell

### 3.05 TESTS

- A. The right is reserved to inspect and test any portion of the equipment and/or materials during the progress of its erection. This contractor shall test all wiring and connections (whether new or existing) for continuity and grounds before connecting any equipment.
- B. The Contractor shall test the entire system in the presence of the Engineer when the work is completed to ensure that all portions are free from shorts or grounds. All equipment necessary to conduct these tests shall be furnished at the Contractor's

expense.

### 3.06 DELIVERY AND STORAGE OF MATERIALS

- A. Make provisions for delivery and safe storage of all materials. Deliver materials to job at such stages of the work as will expedite work as a whole. Carefully mark and store all materials. Carefully check materials furnished for installation, and furnish a receipt acknowledging acceptance of delivery and condition of materials received. Thereafter assume full responsibility for safekeeping of same until final installation has been approved and accepted.

### 3.07 CUTTING AND PATCHING

- A. Carefully lay out all work and coordinate location with architect and other trades. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for proper installation, support or anchorage of raceways, outlets or other electrical equipment, this work shall be the responsibility of this Contractor. Any damage to building, piping, equipment or any defaced finish, plaster, woodwork or metalwork shall be repaired by this contractor at no additional cost to Owner. Do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc. or cutting, drilling, welding of structural members of building, etc. without first obtaining permission from Engineer. If permission is granted, perform work in a manner approved by Engineer. All penetrations through fire resistive construction must be sealed with an approved fire resistive sealant.

### 3.08 DIRECTORY CARDS, NAMEPLATES, AND LABELS

- A. All components of electrical system shall be neatly and accurately labeled to facilitate ready identification and service. Temporary type of markings, which are visible on equipment, will not be permitted. Repaint trims, housing, etc. where such marking cannot be readily removed. Defaced finish must be refinished. All spares or spaces must be labeled in erasable pencil.

### 3.09 OPERATING MANUAL AND PARTS LIST AND INDOCTRINATION OF OPERATING AND MAINTENANCE PERSONNEL

- A. Refer to Division 1.

### 3.10 CLEAN-UP

- A. Remove all materials, scrap, etc. relative to electrical installation, and leave premises in a clean, orderly condition. Any costs to Owner for cleanup of site will be charged to Contractor. At completion, all equipment, lighting fixtures, etc. shall be thoroughly cleaned and all residue removed from the inside and outside surfaces. Defaced finish shall be refinished.

### 3.11 GUARANTEE

- A. Provide in accordance with the General Conditions and Division 1. Leave entire electrical system installed under this Division in proper working order. Replace, without additional charge, any work materials or equipment provided under this Division which develops defects within one year from date of final acceptance. Guarantee all materials and equipment against defects in composition, design or

workmanship.

END OF SECTION

**PART 1 - GENERAL****1.01 RELATED WORK IN OTHER SECTIONS**

- A. Section 26 01 00 General Provisions; Section 26 05 26 Grounding.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general provisions of the Contract, any General and Supplementary Conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

**PART 2 - PRODUCTS****2.01 CONDUCTORS AND CABLES (600 VOLTS)**

- A. Type: Conform to the applicable UL and ICEA Standards for the use intended. Copper conductors with 600-volt insulation unless otherwise specified or noted on the drawings. All #12 conductors shall be solid with stranded conductors for No. 10 and larger.
- B. Aluminum Conductors Prohibited: Aluminum conductors will not be permitted.
- C. Insulation: Type THWN/THHN insulation minimum unless otherwise specified or noted on the drawings. Type THW minimum or type XHHW filled cross-linked polyethylene 90-degree C thermosetting insulation for conductors larger than No. 6 and elsewhere as required by NEC. 90-degree C minimum insulation within fixture wireways of fluorescent fixtures.
- D. Size: No. 12 minimum unless otherwise specified or noted on the drawings. Not less than NEC requirements for the system to be installed. If the equipment to be installed requires larger conductor and equipment sizes than indicated on the drawings, the owner shall be notified.
- E. Wire Color Coding:
1. Color code wires for building voltage classes as follows:

**120/208V - 3 Phase**

A - Black  
B - Red  
C - Blue  
Neutral - White  
Ground - Green

**277/480V - 3 Phase**

A - Brown  
B - Orange  
C - Yellow  
Neutral - Gray  
Ground - Green

**2.02 CONNECTORS AND LUGS**

- A. For copper conductors No. 10 and smaller: 3M Scotch-Lok, T&B or equal spring wire

connectors.

- B. For copper conductors larger than No. 10: Split bolt-type pressure connectors, properly taped or insulated.

### PART 3 - EXECUTION

#### 3.01 SPLICES (480 VOLTS AND UNDER)

- A. Permitted only at outlets or accessible enclosures. Conductor lengths shall be continuous from termination to termination without splices unless approved by the Architect/Engineer.

#### 3.02 RACEWAYS

- A. Install all conductors in an approved raceway system (conduit). Direct buried cables are not acceptable.
- B. Install a ground conductor in all power & lighting circuits above 50 volts.

#### 3.03 CABLE BENDS

- A. Radius of bends shall be not less than 10 times the outer diameter of the cable.

#### 3.04 CONDUCTOR PULL

- A. Conductors shall not be pulled into conduits until after all plastering or concrete work is completed, and all conduits in which moisture has collected have been swabbed out.

#### 3.05 FEEDER IDENTIFICATION

- A. Tag feeder circuits in each enclosure with wrap-around circuit designation labels where more than one feeder passes through or terminates in the enclosure. Not required for branch circuits.

#### 3.06 CONNECTORS AND LUGS

- A. Install with manufacturer's recommended tools and with the type and quantity of deformations recommended by manufacturer.

END OF SECTION

**PART 1 - GENERAL****1.01 RELATED WORK IN OTHER SECTIONS**

- A. Section 26 01 00 General Provisions; Section 26 05 33 Raceways; Section 26 05 19 Conductors; Section 26 05 34 Boxes and Fittings; Section 26 27 26 Wiring Devices and Plates; Section 26 24 16 Panelboards.

**PART 2 - PRODUCTS**

- A. Materials, equipment, and devices related to the grounding system are specified under other sections of these specifications.

**PART 3 - EXECUTION****3.01 GENERAL**

- A. Install grounding conductors as shown on the drawings.
- B. Provide a grounding conductor in all power and lighting branch circuits above 50 volts.

**3.02 EQUIPMENT GROUNDING SYSTEM**

- A. Ground Bar: Provide an uninsulated copper equipment ground bar, separate from any insulated neutral bar, in all switchboards, panelboards, transformers, motor control centers, starters, disconnect switches, cabinets, etc., for grounding the enclosure and for connecting other equipment ground conductors. The ground bar shall be an integrally mounted and braced bus bar in switchboards, or a separately mounted bar adequately braced or bolted to the enclosure of other types of equipment. The ground bar shall be adequately braced or bolted to the enclosure after thoroughly cleaning both surfaces to assure good contact. Provide solderless pressure connectors for all conductor terminations. Number and size of pressure connectors on equipment grounding bars as required for the termination of equipment grounding conductors. In addition to the active circuits, provide pressure connectors for all three-phase spares and spaces.
- B. Conduits: Where metallic conduits terminate without mechanical connection to a metallic housing of electrical equipment by means of lock nut and bushings provide ground bushing connected with a bare copper conductor to the ground bar in the electrical equipment. Metallic conduits containing ground wiring only shall be bonded to the grounding wire at both conduit entrance and exit. Install grounding conductor in all conduits except those used for telephone, sound, or low-voltage signals, and in all flexible conduit. Bond the conductor at both ends to the equipment grounding system.

- C. Feeders and Branch Circuits: Provide a separate green insulated equipment
- FRONTERRA PARK

grounding conductor for each single or three-phase feeder and each branch circuit. Install a grounding conductor in the common conduit or raceway with the related phase and/or neutral conductors and connect to the box or cabinet grounding terminal. Where there are parallel feeders installed in more than one raceway, each raceway shall have a full sized green insulated equipment ground conductor.

- D. Devices: Install a minimum No. 12 green insulated equipment bonding conductor from a grounding terminal in the respective outlet or junction box to the green ground terminal of all receptacles and through flexible conduit to all light fixture housings.

### 3.03 GROUND CONNECTIONS

- A. Clean surfaces thoroughly before applying ground lugs or clamps. If surface is coated, the coating must be removed down to the bare metal. After the coating has been removed, apply a noncorrosive approved compound to cleaned surface and install lugs or clamps. Where galvanizing is removed from metal, it shall be painted or touched up with "Galvanox", or equal.

### 3.04 TESTS

- A. Test the completed grounding system with a megger at the service ground bar and submit a written report to the Engineer for approval. The service shall not be energized if the test shows more than 5 ohms unless approved by the Engineer.

END OF SECTION



**PART 1 - GENERAL****1.01 RELATED WORK IN OTHER SECTIONS**

- A. Section 26 01 00 General Provisions; Section 26 05 26 Grounding.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general provisions of the Contract, any General and Supplementary conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

**PART 2 - PRODUCTS****2.01 CONDUITS**

- A. Rigid Steel Conduit: Rigid, threaded, thick-wall, zinc-coated on the outside and either zinc-coated or coated on the inside. ANSI C80.1.
- B. Electrical Metallic Tubing (EMT): Mild steel, zinc-coated on the outside and either zinc-coated or coated with an approved corrosion-resistant coating on the inside. The use of 2" or larger EMT by UCB permission only.
- C. Flexible Conduit: Commercial Greenfield, galvanized steel, with a separate grounding bond wire installed in the conduit in addition to other wires. MC and AC cable and extra flexible conduit are not acceptable.
- D. PVC Conduit (schedule 40): Polyvinyl chloride.
- E. Liquidtight flexible conduit: PVC coated with an inner metallic jacket.
- F. Conduit Size: Minimum conduit size is 3/4" for all circuits. All conduit for branch circuit receptacles, motor feeders and panelboard feeders shall be as required by the NEC for RH, RHH, and RHW insulation regardless of the type of insulation actually used.
- F. Provide a pull string in all empty conduits.
- G. Provide a grounding conductor with all circuits.

**2.02 CONDUIT FITTINGS**

- A. Rigid Steel Conduit, IMC, and EMT Fittings: Iron or steel only.
- B. Flexible Conduit Fittings (Commercial Greenfield): Steel only, with insulated throats, and shall be:

1. Squeeze or clamp type with bearing surface contoured to wrap around the

conduit and clamped by one or more screws.

- C. Connectors and Couplings: Compression type threadless fittings for rigid steel conduit or IMC not permitted. EMT couplings and connectors shall be steel only, "Concrete-tight" or "Rain-tight" (gland and ring compression type) or steel set screw type. Connectors to have insulated throats.
- D. Bushings: Insulated type, designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system, for rigid steel conduit, IMC, and EMT conduit larger than 1-1/4" size. Provide grounding type bushings on all feeder conduits.

### PART 3 - EXECUTION

#### 3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size all conduits to meet the requirements of National Electrical Code, all power or feeder conduits shall meet the requirements for RHH and RHW insulation regardless of the type of wire actually used. Minimum flexible conduit size shall be 1/2". Three-eighths inch flexible conduit is permitted if furnished as part of a manufactured equipment connection.
- B. The maximum length of flexible conduit for connections to lighting equipment is 6'-0". Flexible conduit may also be used where installing new devices in existing walls and the wall or structure has to be "fished". MC and AC cables are not acceptable.
- C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping. Coordinate the proposed conduit routing with the Architect prior to installation.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Support conduit from building structure using galvanized straps, clevis hangers, or bolted split stamped galvanized hangers. Do not support conduits from ceiling suspension wires.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used or temporary conduit support during construction, before conductors are pulled. Multi-use suspension systems for plumbing and other piping along with electrical conduits shall not be permitted unless the hangers were designed for all the piping and conduit loads and will support a minimum of 200 lbs.

#### 3.02 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipecutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. For all metallic conduits, provide insulated bushing or throat bushings for 1-1/4" diameter and larger. Provide grounding lug bushings where conduits enter switchboards.
- E. Install no more than the equivalent of three 90-degree bends between boxes
- F. Use conduit bodies to make sharp changes in direction, as around beams.
- G. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
- H. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- I. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- J. Install expansion joints where conduit crosses building expansion joints.
- K. Where conduit penetrates waterproofed floors or exterior walls subject to entry of moisture, provide pipe sleeves two sizes larger than conduit, suitably flashed or sealed where appropriate. Seal annular space around conduit with UL listed foamed silicone elastomer compound., For conduit penetrations through exterior foundation walls below grade, all conduit shall be sloped away from the building to prevent entry of moisture. Pipe sleeve shall be large enough to allow up to 3" of vertical movement about the conduit without damage in the event that the foundation rises.
- L. Provide grounding type bushings around all conduits terminated through concentric or eccentric knockouts.

### 3.03 CONDUIT INSTALLATION SCHEDULE

- A. Concealed Dry Interior Locations: Rigid steel conduit or electrical metallic tubing. Do not use EMT in concrete slabs or walls.
- B. Exposed Dry Interior Locations: Rigid steel conduit from floor level to +4'-0" above finished floor where exposed to travel areas (corridors, receiving, etc.) or where likely to be damaged. Electrical metallic tubing above +4'-0" from finished floor. All surface conduit shall be painted. Wiremold shall be used in some finished areas as shown on the drawings.
- C. Flexible metal conduit shall be utilized for the following:
  - 1. Transformer final connections.
  - 2. Mechanical equipment final connections.
  - 3. Lighting equipment final connections.

4. Installation of devices in existing walls or ceilings to remain where rigid conduit cannot be installed.
- D. Direct buried conduit: PVC schedule 40 conduit with transition to GRC with a GRC elbow before rising above grade through a floor or into a wall. No PVC shall be located inside the building exposed above grade.

END OF SECTION

**PART 1 - GENERAL****1.01 RELATED WORK IN OTHER SECTIONS**

- A. Section 26 01 00 General Provisions; Section 26 05 26 Grounding.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general provisions of the Contract, any General and Supplementary Conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

**PART 2 - PRODUCTS****2.01 OUTLET BOXES**

- A. Construction: Zinc-coated or cadmium-plated sheet steel boxes of a class to satisfy the condition at each outlet except where unilet or conduit bodies are required. Knockout type with knockouts removed only where necessary to accommodate the conduit entering. Square cornered, straight sided gang boxes, 4-inch octagon concrete rings and 4-inch octagon hung ceiling boxes with bars may be folded type; one-piece deep-drawn for all other boxes.
- B. Size: To accommodate the required number and sizes of conduits, wires and splices in accordance with NEC requirements, but not smaller than 4" square. Standard concrete type boxes not to exceed 6 inches deep except where necessary to permit entrance of conduits into sides of boxes without interference with reinforcing bars. Special purpose boxes shall be sized for the device or application indicated.
- C. Fixture Studs: 3/8-inch malleable-iron fixture stud in outlet boxes for ceiling lighting fixtures and interior bracket lighting fixtures, other than lamp receptacles and drop cords.
- D. Exposed: Screw-joint type, with gasketed weatherproof covers in locations exposed to the weather.
- E. Light Fixture Boxes: 4-inch diameter by 1-1/2 inch deep minimum for ceiling and interior bracket fixtures with concealed conduits. Plaster covers for bracket fixtures to have 3-inch diameter openings. Screw-joint boxes with canopy seat for ceiling and interior bracket fixtures with exposed conduits.

**PART 3 - EXECUTION****3.01 OUTLET BOXES**

- A. Installation: Unless otherwise specified or shown on the drawings, outlet boxes shall be flush mounted and the front edges of the boxes or plaster covers shall be flush

with the finished wall or ceiling line, or if installed in walls and ceilings of incombustible construction, not more than 1/4-inch back of same. Mount boxes with the long axis of devices vertical. Boxes in plastered walls and ceilings shall be provided with plaster covers. Box extensions and/or covers will not be permitted. Install in a rigid and satisfactory manner with suitable metal bar hangers, box cleats, adjustable box hangers, etc. Use wood screws on wood, expansion shields on masonry and machine screws on steel work.

- B. Mounting Heights: The mounting height of a wall-mounted outlet box shall be construed to mean the height from the finished floor to the horizontal center line of the cover plate. On exposed tile, block, or brick construction, mount outlet boxes at the nearest bed joint to the mounting height indicated. Verify with Architect.
- C. Box extensions shall be prohibited on new construction.
- D. Provide "Bell" or FS boxes for surface installations in all high traffic areas such as corridors, circulation spaces, exterior colonnades, plazas, etc.

### 3.02 FIXTURE CONNECTIONS

- A. Recessed or surface light fixtures in lay-in or accessible ceilings shall be connected with minimum 3/8-inch flexible metallic conduit, 4 to 6 feet long, with grounding provisions.

END OF SECTION

PART 1 - GENERAL

## 1.01 RELATED WORK IN OTHER SECTIONS

- A. Section 26 01 00 General Provisions and Section 26 05 19 Conductors.

## 1.02 RELATED DOCUMENTS

- A. Drawings, general provisions of the Contract between the General Contractor and any General and Supplementary Conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

## 1.03 SUBMITTALS

- A. Submit complete shop drawings with outline dimensions, descriptive literature, and complete description of the frame size, trip setting, class, and interruption rating of all overcurrent devices. Identify available spaces.

PART 2 - PRODUCTS

## 2.01 GENERAL

- A. Dead front, safety type with voltage ratings as scheduled. Pedestal shall be MCB on the load side of the meter with an Xcel cold sequence disconnect on the line side of the meter, **all copper bus** and be of the type required for the short circuit and duty ratings indicated on the drawings or specified and shall include integral U.L. listed 1449 TVSS protection. Rated for service entrance use as required with metering and approved for Xcel Energy applications. Pedestal shall be as manufactured by MilBank Manufacturing.

## 2.02 CABINETS

- A. Each pedestal shall be enclosed in a single sheet metal cabinet with front doors, catches, locks, etc.

## 2.03 BREAKERS

- A. Panels shall include main circuit breaker as shown on the panel schedules on the drawings. Molded-case or combination molded-case and current-limiting fuses as scheduled or required. Provide quick-make and quick-break toggle mechanism, inverse-time trip characteristics, and trip-free operation on overload or short-circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide a trip element for each pole, a common-trip bar for all poles and a single molded insulating material handle. Handle ties will not be accepted. Adjustable magnetic trip devices shall be set at the factory to the low trip setting. Provide breaker frame sizes as required for the continuous rating or the interrupting capacity, whichever is larger.

## 2.04 DIRECTORIES

- A. Provide typed circuit directories on the inside face of the door of each panel. Label all spares and spaces in erasable pencil. Mount in frame attached to door.

### PART 3 - EXECUTION

#### 3.01 DIRECTORIES

- A. Provide typed circuit descriptions referencing permanent room numbering assigned in lieu of the room numbering shown on the drawings.

#### 3.02 PHASE ROTATION

- A. Phase A left bus; phase B center bus; phase C right bus (front viewing). Verify rotation of existing panelboard feeders before beginning modifications.

END OF SECTION



**PART 1 - GENERAL****1.01 RELATED WORK IN OTHER SECTIONS**

- A. Section 26 01 00 General Provisions; Section 26 05 26 Grounding.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general provisions of the Contract, any General and Supplementary Conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

**PART 2 - PRODUCTS****2.01 RECEPTACLES**

- A. General: Configuration and requirements for all connector or outlet receptacles shall be in accordance with NEMA Publications. Fire-resistant, non-absorptive, hot-welded, phenolic composition or equal bodies and bases with metal plaster ears (integral with the supporting member) and 20 amp minimum. Receptacles shall comply with Federal Spec. #W-C-596E.
- B. Grounding Type: All receptacles shall be grounding type with a green colored hexagonal equipment ground screw of adequate size to accommodate an insulated grounding jumper the same size as the phase conductor. Grounding terminals of all receptacles shall be internally connected to the receptacle mounting yoke.
- C. Unless otherwise noted, receptacles shall be as follows:  
  
Hubbell #5362-I or 5362-GF for ground fault.

**2.02 DEVICE PLATES**

- A. General: Provide device plates/cover for each receptacle. Plates shall be smooth lexan, of spec. grade, ivory color, as manufactured by Hubbell, Leviton, Arrow-Hart, Daniel Woodhead or Eagle.
- B. Exposed: Plates for exposed jointed fittings shall match the fittings with edges of plates flush with edges of fittings. Heavy cadmium plated steel with gasket. Plates for cast type boxes at locations subject to wet or rain conditions shall be of the cast, vapor-tight type. Provide hinged lift covers for devices.

**PART 3 - EXECUTION**

- A. Install holiday lighting receptacles vertically at approx. 11' above grade in the light pole. Include a weatherproof while in use cover.

END OF SECTION

**PART 1 - GENERAL****1.01 RELATED WORK IN OTHER SECTIONS**

- A. Section 26 01 00 General Provisions; Section 26 05 26 Grounding.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general provisions of the Contract, any General and Supplementary Conditions to the Contract, provisions of applicable Subcontractor Agreements, and other Division 1 Specification sections apply to work of this section.

**1.03 SUBMITTALS**

- A. Submit for approval complete shop drawings, catalog cuts, special installation instructions, photometric data and descriptive literature. When fixtures are proposed for substitution and prior approval has not been issued in the form of an addenda they will not be reviewed.

**PART 2 - PRODUCTS****2.01 GENERAL**

- A. Furnish all lighting fixtures throughout of the type indicated on the drawings, complete with lamps, sockets, wiring, fitters, hangers, plaster rings, canopies, etc., as required.

**2.02 LAMPS**

- A. All fixtures shall be 50,000 hour rated LED's.

**PART 3 - EXECUTION****3.01 SUPPORTS**

- A. Support ceiling fixtures by anchorage to the ceiling only where the ceiling is concrete or masonry units. For ceilings of other construction, anchor ceiling fixtures to metal or wood supports provided for that purpose, of suitable strength and stability, adequately attached to and supported by joists, trusses or other structural members, unless other methods of support are specifically approved by the Architect.

**3.02 CLEAN-UP**

- A. At final inspection the fixtures and lighting equipment shall be in first class operating order, in perfect condition as to finish, free from defects, completely lamped, clean and free from dust, plaster or paint spots, and complete with the required glassware, reflectors, side panels, louvers, or other components necessary to complete the fixtures.

END OF SECTION

<p style="text-align: center;"><b>SPECIFICATIONS FOR CORTEZ STYLE FLUSH TOILET BUILDINGS</b></p>
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**1.0    SCOPE**

This specification covers the construction and placing of the Cortez precast concrete flush toilet building as produced by CXT Incorporated.

**2.0    SPECIFICATIONS**

ASTM C33	Concrete Aggregates
ASTM C39	Method of Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C143	Method of Test for Slump of Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, or Concrete
ASTM C192	Method of Making and Curing Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C309	Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C979	Standard Specification for Pigments for Integrally Colored Concrete
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 306	Cold Weather Concreting
ACI 318	Building Code Requirements Structural Concrete and Commentary (includes Errata)
PCI MNL 116	Quality Control for Plants and Production of Precast Prestressed Concrete Products

### **3.0 MANUFACTURER CRITERIA**

The manufacturer supplying the requested precast concrete flush facility must meet the following:

- A.** Manufacturer must be ISO 9001 certified at the time of bid.
- B.** Manufacturing plant must be PCI certified at the time of bid.
- C.** Manufacturer must not have defaulted on any contract within the last five years.
- D.** Manufacturer must provide stamped, engineered drawings prior to acceptance.
- E.** Manufacturer must be pre-approved prior to bidding.
- F.** Manufacturer must show four examples of precast concrete flush facilities produced, installed and in use as an example of their ability to perform this contract.
- G.** Manufacture shall provide a 20 year warranty.

Manufacturers meeting these criteria are:

CXT, Incorporated  
Spokane Industrial Park  
3808 North Sullivan Road, Building 7  
Spokane, WA 99216  
Phone: 800-696-5766

### **4.0 DESIGN CRITERIA**

The Cortez has been designed to individually meet the following criteria. Calculations and Engineer's stamped drawings are available, for standard buildings, upon request by the customer and are for their sole and specific use only. The design criteria are to ensure that the Cortez not only will withstand the forces of nature listed below but to provide protection from vandalism and other unforeseen hazards. Design criteria include 2006 IBC Code, 2006 IPC, 2008 NEC.

- A.     Roof Snow Load**
  - 1.       The Cortez is designed to withstand a 250 pounds per square foot snow load
- B.     Floor Load**
  - 1.       The Cortez is designed to withstand 400 pounds per square foot floor load

**C. Wind Load**

1. The Cortez will withstand the effects of 150 mile per hour (3-second gust) wind exposure C

**D. Earthquake**

1. The Cortez will withstand the effects of a seismic group 1 design category E earthquake.

**E. Additional Design Standards**

1. The Cortez is designed to meet the requirements of the sixty-inch turning radius inside toilet room specified by the American with Disabilities Act Requirements and Uniform Federal Accessibility Standards as of the date of these specifications.
2. The Cortez is an all concrete design with a minimum 3/12 roof pitch.
3. The Cortez shall have a minimum 4 inch wall, 4 ½ inch roof, and 5 inch floor thickness.
4. All wall to floor interior surface seams shall have a minimum 1" radius coving made of high strength grout.

**5.0 MATERIALS**

**A. Concrete - General**

The concrete mix design will be designed to ACI 211.1 to produce concrete of good workability.

1. Concrete will contain a minimum of 675 pounds of cementitious material per yard. Cement will be a low alkali type I/II or III conforming to ASTM C-150
2. Coarse aggregates used in the concrete mix design will conform to ASTM C33 with the designated size of coarse aggregate #67.
3. Minimum water/cement ratio will not exceed .45.
4. Air-entraining admixtures will conform to ASTM C260. Water reducing admixtures will conform to ASTM C494, Type A.
5. If Self Compacting Concrete (SCC) is used, it must conform to ASTM C1611

**B. Colored Concrete**

1. Color additives will conform to ASTM C979. A 12"x12"x1" color sample will be available for customer approval.
2. The following will contain colored concrete:
  - a. Toilet building roof panels

- b. Building walls
- c. Screen panels
- 3. The same brand and type of color additive will be used throughout the manufacturing process.
- 4. All ingredients will be weighed and the mixing operation will be adequate to ensure uniform dispersion of the color.

**C. Cold Weather Concrete**

- 1. Cold weather concrete placement will be in accordance with ACI 306.
- 2. Concrete will not be placed if ambient temperature is expected to be below 35 degrees F. during the curing period unless heat is readily available to maintain the surface temperature of the concrete at least 45 degrees F.
- 3. Materials containing frost or lumps of frozen materials will not be used.

**D. Hot Weather Concrete**

The temperature of the concrete will not exceed 95 degrees F. at the time of placement. When the ambient reaches 90 degrees F. the concrete will be protected with moist covering.

**E. Concrete Reinforcement**

- 1. All reinforcing steel will conform to ASTM A615. All welded wire fabric will conform to ASTM A185.
- 2. All reinforcement will be new, free of dirt, oil, paint, grease, loose mill scale and loose or thick rust when placed.
- 3. Details not shown of drawings or specified will be to ACI318.
- 4. Steel reinforcement will be centered in the cross-sectional area of the walls and will have at least 1 1/4" of cover on the under surface of the floor.
- 5. The maximum allowable variation for center-center spacing of reinforcing steel will be 1/2".
- 6. Full lengths of reinforcing steel will be used when possible. When splices are necessary on long runs, splices will be alternated from opposite sides of the components for adjacent steel bars. Lap bars #4 or smaller a minimum of 12". Lap bars larger than #4 a minimum of 24 bar diameters.
- 7. Reinforcing bars will be bent cold. No bars partially embedded in concrete will be field bent unless approved by the customer.

**F. Sealers and Curing Compounds**

1. Curing compounds, if used, will be colorless, complying with ASTM C309, type I or 1-D.
2. Weatherproofing sealer for exterior of building will be a clear water repellent penetrating sealer.

**G. Caulking, Grout, Adhesive and Sealer**

1. Caulking service temperatures from -40 to +194 degrees Fahrenheit.
2. Interior and exterior joints will be caulked with a paintable polyurethane sealant.
3. Grout will be a non-shrink type and will be painted to match the color of surrounding concrete as nearly as possible.
4. Cement base coating is formulated with a very fine aggregate system and is a built in bonding agent.

**H. Paint**

1. All paints and materials will conform to all Federal specifications or be similar “top-of-the-line-components”. Paints will not contain more than .06 percent by weight of lead.
2. Type of paints for toilets
  - a. Inside concrete surfaces
    - I Interior floors will be a chemical resistant urethane. The color will be gray.
    - II Interior walls and ceilings will be a modified acrylic, water repellent penetrating stain. The color will be white followed by a clear acrylic anti-graffiti sealer.
  - b. Metal surfaces both inside and out
    - I DTM ALKYD
  - c. Exterior concrete surfaces
    - I Exterior slab will be clear sealer
    - II Exterior walls and roof will be a water repellent penetrating stain in the same color as the walls or roof followed by a clear acrylic anti-graffiti sealer

**I. Grab bars**

Grab bars will be 18 gauge, type 304 stainless steel with 1-1/2” clearance. Grab bars will each be able to withstand 300 pound top loading.

**J. Toilet Paper Dispenser**

Dispenser will be constructed of 1/4” thick, type 304 stainless steel. Dispenser will be capable of holding three (3) standard rolls of toilet



paper. Toilet paper holder fastening system will be able to withstand 300 pound top loading.

**K. Steel Doors**

1. Doors will be flush panel type 1-3/4" thick, minimum 16 gauge Galvanized steel, top painted with DTM ALKYD.
2. Door frames will be knockdown or welded type, single rabbet, minimum 16 gauge prime coated steel top painted with DTM ALKYD, width to suit wall thickness. Three (3) rubber door silencers will be provided on latch side of frame.

**L. Door Hinges**

Door hinges will be 3 per door with dull chrome plating 4-1/2"x4-1/2", adjustable tension, automatic-closing for each door.

**M. Lockset**

1. Lockset will meet ANSI A156.2 Series 4000, Grade 1 cylindrical lockset for exterior door.
2. Lever handle both inside and out
3. Either handle operates latch unless outside handle is locked by inside push-button.
4. Push-button will automatically release when inside lever handle is turned or door is closed.
5. Emergency slot on exterior so door can be unlocked from the outside with a coin, screwdriver and etc.
6. Inside lever always active.
7. U.S. 26D finish.

**N. Dead Bolt**

Deadbolt will be a Lori Lock standard model with a double cylinder, 2 3/4" backset, and US26D finish. The cylinder will be a standard 1 1/8" Schlage Mortise cylinder with compression ring and 626 finish.

**O. Door Stop**

Doorstop will be a dome style stop meeting ANSI 156.16.

**P. Double Coat Hook**

Coat hook will be 304 stainless steel 16 gauge (1.5mm), formed construction with a satin finish and have 3/16"x 7/8" nail in anchor.

Upper hook will extend at least 2-1/2" inches from the wall. Lower hook will extend at least 1-1/4" from the wall.

**Q. Door Sweep**

Door sweep will be provided at the bottom of door and will be an adjustable brush type.

**R. Wall Vent**

Wall vent will be crank operated allowing the unit to be opened or closed. Crank will be removable. Vent cover will be 14 gauge 304 stainless steel painted with DTM and anchored into the concrete wall with high strength anti-rust tap con fasteners. Vent to come with insect screen. Cover to be recessed a minimum 3/4" on exterior walls with a 45 degree bevel. Interior to be flush mounted. Wall vent will not protrude from the wall.

**S. Signs**

1. Signs to have raised pictograms, letters and Braille to meet ADA.
2. All signs inset a minimum of 3/4" into wall with 45 degree bevel.
3. All signs to be anchored into concrete with 1/4" x 3/4" concrete anchor nails.

**T. Windows**

1. Window frames will be constructed from steel.
2. Window glazing will be 3/16" thick translucent pebble finished mar-resistant Lexan.
3. Windows to have 3/4" recess with 45 degree bevel.
4. Window frames to have vandal resistant fasteners.

**U. Plumbing**

1. All fixtures to meet ANSI A112.19.2
2. Waste and vent material will be ABS or PVC plastic and will be plumbed to meet Uniform Building Codes.
3. Water material will be copper tubing Type L, hard drawn. A gate valve will be provided at the inlet end of the water line. All water lines will be of a size to provide proper flushing action based on a nominal water pressure of 40 psi.
4. All plumbing will be concealed in the service area.
5. Toilet will be constructed of vitreous china, wall hung, with siphon jet action. Toilet will have a back spud for a concealed flush valve connection and will be mounted with the top of the seat 18 inches above the finished floor. Seat will be heavy duty solid plastic with an open front. Optional stainless steel fixtures available.
6. Flush valve will be concealed closet flush-o-meter constructed of

rough brass. Furnish valve with integral vacuum breaker and wall mounted push button. Valve will be of a water saver type with a flow of 1.6 gallons per flush.

7. Lavatory will be vitreous china with back splashguard, front overflow opening, equipped with brass trap and drainpipe without stopper. Sink will be 20 inches wide x 18 inches front to back x 5 ¾ inches deep with ADA trap cover. Optional stainless steel fixtures available.
8. Water valve will be self-closing water set with indexed push button.
9. Hose bib available in the chase area.
10. A main shut-off valve and drain will be provided with plumbing.
11. Hammer arrester to be installed on water line.
12. Trap primer distribution unit shall be installed.
13. Optional Instant-Flow tankless electric water heater. Temperature rise of 75 degrees at .5gpm with a temperature preset of 104 degrees.

## **V. Electrical**

1. All components UL listed
2. All electrical wiring will be in conduit, surface mounted in the service area and concealed in the user compartments. All wire will be copper.
3. A 100-amp NEMA 3R breaker panel will be provided and must be mounted on the exterior of the building to meet electrical code.
4. The chase area will have, cast in both common walls, lexan windows to allow light into each toilet room with one (1) 4-foot 3 bulb ceiling mounted low temperature ballast light fixture.
5. 2 exterior 35-watt High Pressure Sodium lights, polycarbonate vandal resistant.
6. The optional hand dryer is an air compression type with remote motor unit. Push button switch located in cast nozzle housing with flexible hose connecting blower motor, housing and nozzle. Power input 120VAC, 7A (non-heated air).
7. Two restroom area exhaust fans HVI certified, with 270 CFM speed controlled (control in chase area)
8. Lighting on the exterior of building will be photocell activated; interior will be motion activated; override switch in chase/utility room.

## **6.0 MANUFACTURE**

### **A. Mixing and Delivery of Concrete**

Mixing and delivery of concrete will be in accordance with ASTM C94, section 10.6 through 10.9 with the following additions:

1. Aggregate and water will be adjusted to compensate for differences in the saturated surface-dry condition.

**B. Placing and Consolidating Concrete**

Concrete will be consolidated by the use of mechanical vibrators. Vibration will be sufficient to accomplish compaction but not to the point that segregation occurs.

**C. Finishing Concrete**

1. Interior floor and exterior slabs will be floated and troweled.
2. All exterior building walls and exterior screen walls will be any one of the available textures.
3. All exterior surfaces of the roof panels will be cast to simulate any one of the available textures. The underside of the overhang will have a smooth finish.

**D. Cracks and Patching**

1. Cracks in concrete components which are judged to affect the structural integrity of the building will be rejected.
2. Small holes, depressions and air voids will be patched with a suitable material. The patch will match the finish and texture of the surrounding surface.
3. Patching will not be allowed on defective areas if the structural integrity of the building is affected.

**E. Curing and Hardening Concrete**

1. Concrete surfaces will not be allowed to dry out from exposure to hot, dry weather during initial curing period.

**7.0 FINISHING AND FABRICATION**

**A. Structural Joints**

1. Wall components will be joined together with two welded plate pairs at each joint. Each weld plate will be 6" long and located one pair in the top quarter and one pair in the bottom quarter of the seam. Weld plates will be anchored into the concrete panel and welded together with a continuous weld. The inside seams will be a paintable caulk. The outside seams will use a caulk in a coordinating building color or clear.

2. Walls and roof will be joined with weld plates, 3"x6" at each building corner.
3. The joint between the floor slab and walls will be joined with a grout mixture on the inside, a matching colored caulk on the outside and two weld plates 6" long per wall.

## **B. Painting/Staining**

1. An appropriate curing time will be allowed before paint is applied to concrete.
2. Some applications may require acid etching. A 30% solution of hydrochloric acid will be used, flushed with water and allowed to thoroughly air dry.
3. Painting will not be done outside in cold, frosty or damp weather.
4. Painting will not be done outside in winter unless the temperature is 50 degrees F. or higher.
5. Painting will not be done in dusty areas.
6. All surface voids to be filled prior to painting
7. Schedule of finishes
  - a. Inside concrete surfaces
    - I Inside floors will be 1 coat of 1-part water based chemical resistant urethane.
    - II Interior walls and ceilings will be 2 coats of a modified acrylic, water repellent penetrating stain, followed by 1 coat of clear sealer.
  - b. Metal surfaces both inside and out
    - I 2 coats of DTM ALKYD
  - c. Exterior concrete surfaces
    - I Exterior walls will be 2 coats of water repellent penetrating stain in the same color as the walls or roof followed by 1 coat of clear acrylic anti-graffiti sealer.

## **8.0 TESTING**

The following tests will be performed on concrete used in the manufacture of toilets. All testing will be performed in the CXT (PCI certified) laboratories. Testing will only be performed by qualified individuals who have been certified ACI Technician Grade 1. Sampling will be in accordance with ASTM C172.

1. The air content of the concrete will be checked per ASTM C231 on the first batch of concrete. The air content will be in the range of 5.0% +/- 2.0%.
2. The compressive strength of the cylinders will be tested to ASTM C39. We will make one (1) cylinder for release, one (1) for 7-days and one (1) for 28-days. The release must be a minimum strength of 2500 psi, the 7-day must be a minimum of 4500 psi and the 28-day must be a minimum of 5000 psi.

3. A copy of all test reports will be available to the customer as soon as 28-day test results are available.

## **9.0 INSTALLATION**

### **A. Scope of Work**

Work specified under this Section relates to the placement of the unit by CXT on customer prepared foundations.

### **B. Location**

It's the responsibility of the customer to:

1. Provide exact location by stakes or other approved method.
2. Provide clear and level site free of overhead and/or underground obstructions.
3. Provide access to the site for truck delivery and sufficient area for the crane to install and the equipment to perform the contract requirements.
4. Water, electrical, and sewage site connections to be placed per CXT drawings. Must be placed to easily connect to the building.

### **C. Compacting**

The bottom of the area must be compacted after it has been dug out. After the base has been placed, it must be compacted as well. The bearing of the soil and base should be a minimum of 1,500 pounds per square foot.

### **D. Base**

After compacting the bottom of the area, a minimum of 6" of a compacted,  $\frac{3}{4}$ " minus material base of gravel (i.e. road base) should be placed for support, leveling and drainage purposes. The base also limits frost action. The base must be confined so as to prevent washout, erosion or any other undermining.

### **E. Access to Site**

Delivery to site made on normal highway trucks and trailers. If at the time of delivery conditions of access are hazardous or unsuitable for truck and equipment due to weather, physical constraints, roadway width or grade, CXT may require an alternate site with better access provided to ensure a safe and quality installation. In any such case, additional costs for cranes, trucking, and etc. will be charged to the account of the customer.

## **10.0 WARRANTY—PRECAST DIVISION**

CXT provides a warranty against defects in material or workmanship for a period of twenty (20) years on all concrete components. The warranty is valid only when concrete is used within the specified loadings. Furthermore, said warranty includes only the related material necessary for the construction and fabrication of said concrete components. All other non-concrete components will carry a one (1) year warranty. CXT warrants that all goods sold pursuant hereto will, when delivered, conform to specifications set forth above. Goods shall be deemed accepted and meeting specifications unless notice identifying the nature of any non-conformity is provided to CXT in writing within the specified warranty. CXT, at its option, will repair or replace the goods or issue credit for the customer provided CXT is first given the opportunity to inspect such goods. It is specifically understood that CXT's obligation hereunder is for credit, repair or replacement only, F.O.B. CXT's manufacturing plants, and does not include shipping, handling, installation or other incidental or consequential costs unless otherwise agreed to in writing by CXT.

This warranty shall not apply to:

1. Any goods which have been repaired or altered without CXT's express written consent, in such a way as in the reasonable judgment of CXT, to adversely affect the stability or reliability thereof;
2. To any goods which have been subject to misuse, negligence, acts of God or accidents or
3. To any goods which have not been installed to manufacturer's specifications and guidelines, improperly maintained, or used outside of the specifications for which such goods were designed.

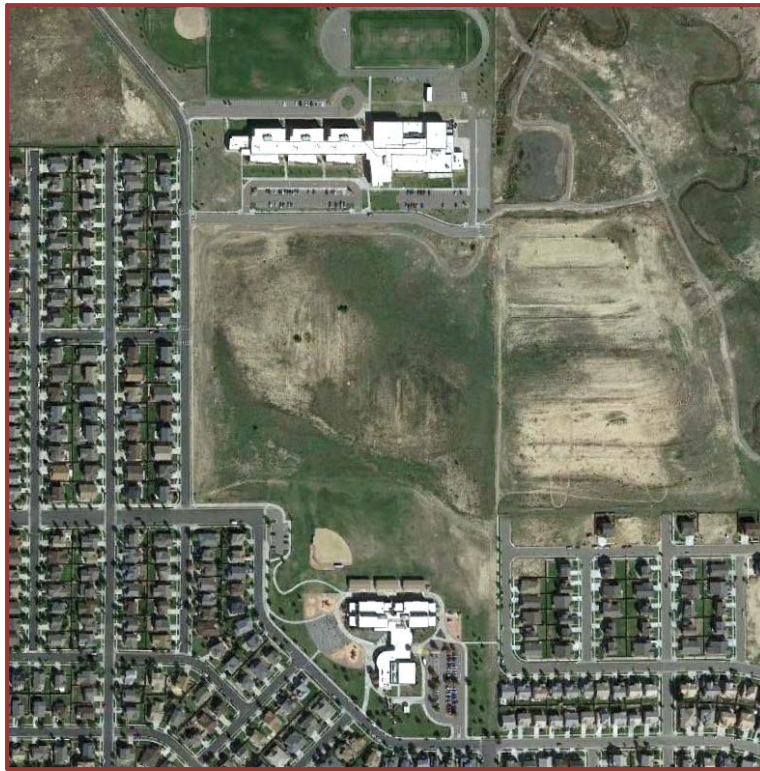
## **11.0 DISCLAIMER OF OTHER WARRANTIES**

The warranty set forth above is in lieu of all other warranties, express or implied. All other warranties are hereby disclaimed. CXT makes no other warranty, express or implied, including, without limitation, no warranty of merchantability of fitness for a particular purpose or use.

## **12.0 LIMITATION OF REMEDIES**

In the event of any breach of any obligation hereunder, breach of any warranty regarding the goods or any negligent act or omission or any party, the parties shall otherwise have all rights and remedies available at law; however, IN NO EVENT SHALL CXT BE SUBJECT TO OR LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

**Subsurface Exploration Program  
and Geotechnical Evaluation  
Fronterra Park  
Commerce City, Colorado**



Prepared For:

**DHM Design**  
900 South Broadway, Suite 300  
Denver, Colorado 80209

**Attention: Mr. Kyle Davis**

**Job Number: 14-3066**

**August 28, 2014**



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## **PURPOSE AND SCOPE OF STUDY**

This report presents the results of a subsurface exploration program performed by GROUND Engineering Consultants, Inc. (GROUND) to provide a geotechnical evaluation in support of design and construction of improvements at Fronterra Park southeast of the intersection of E. 101<sup>st</sup> Way and Joplin Street in Commerce City, Colorado. Our study was conducted in general accordance with GROUND's Proposal No. 1407-1102, dated July 14, 2014.

Field and office studies provided information obtained at the test hole locations regarding surface and subsurface conditions, including the existing site vicinity improvements. Material samples retrieved during the subsurface exploration were tested in our laboratory to assess the engineering characteristics of the site earth materials, and assist in our geotechnical analysis. Results of the field, office, and laboratory studies are presented below.

This report has been prepared to summarize the data obtained and to present our findings and conclusions based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of engineering considerations related to construction of the proposed improvements are included herein.

## **PROPOSED CONSTRUCTION**

We understand that proposed park improvements will include a large and small shelter, a restroom building, a skating area, a multi-use hardcourt and a small parking lot. A network of sidewalks will be installed as well. None of the shelters/buildings will have below-grade (basement) levels. We assume that foundation loads will be low, typical of these types of construction. We also understand that only limited cuts and fills, up to about 5 feet in thickness, are planned to construct the improvements.

If the proposed construction differs significantly from that described above, GROUND should be notified to re-evaluate the conclusions and parameters contained herein.

## **SITE CONDITIONS**

At the time of our subsurface exploration, the site consisted of largely undeveloped ground. The ground surface supported weeds, succulents, grasses, deciduous trees and exposed cobbles, sands, and clays. The site topography was slightly rolling topography with grades generally descending gently to the northeast.

The site is surrounded by schools to the north and south and single family residences to the east and west. Additionally, The Flat 14ers – Second Creek Elementary School to Stuart Middle School Trail traverses the north and west margins of the site.

Numerous prairie dogs holes were observed on site as well.

## **GEOLOGIC SETTING**

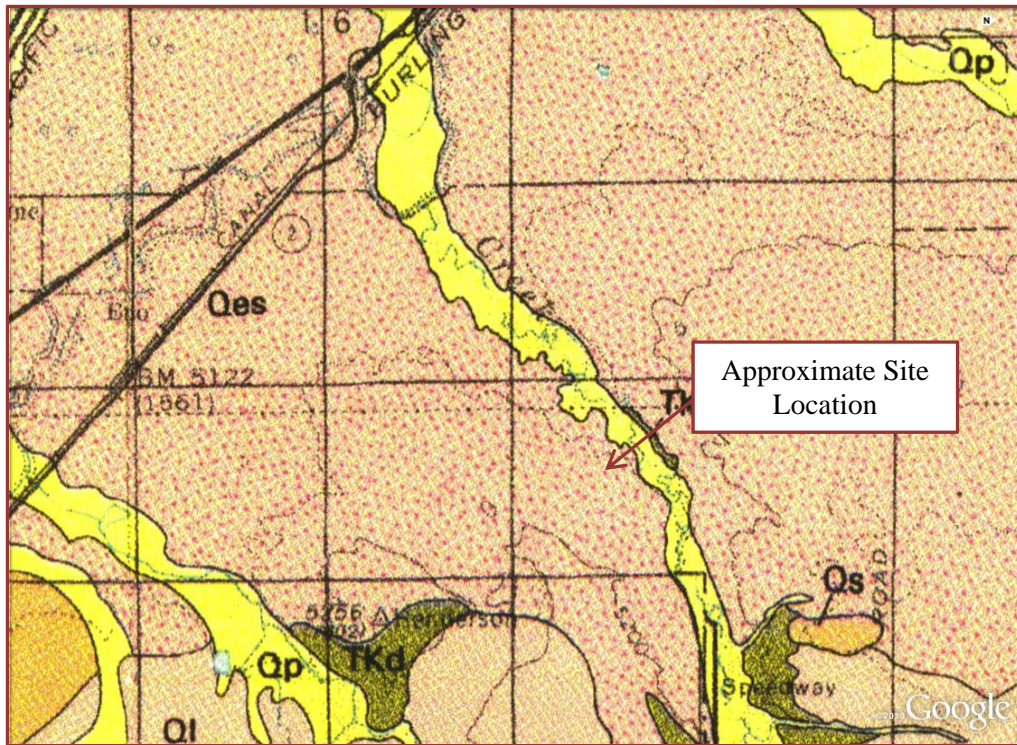
Published geologic maps, e.g., Trimble and Machette (1979)<sup>1</sup> depict the site as underlain by upper Pleistocene to lower Holocene Eolian (wind-blown) Sands (**Qes**). The Eolian Sands typically consist of fine to medium sands with subordinate volumes of silts and clays. Weathering commonly increases the clay contents of the deposits. Commonly, eolian deposits exhibit potentials for hydro-consolidation or “collapse.”

The surficial soils are mapped as underlain by the upper Cretaceous to lower Tertiary Denver Formation (**TKd**) which in the project area consists largely of irregularly interbedded claystones, siltstones, and sandstones. The claystones are typically moderately to highly expansive. The sandstones include well cemented beds that can be very hard and can be difficult to excavate. A portion of that map is reproduced below.

We interpret the native soils encountered in the test holes to be Eolian Sands, interbedded locally with alluvial (stream-laid) deposits. We interpret the underlying bedrock materials to be Denver Formation deposits.

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<sup>1</sup> Trimble D. and Machette, M., 1979, Geologic Map of Greater Denver Area, Front Range Urban Corridor, Colorado: U.S. Geological Survey, Geologic Quadrangle Map I-856-H.



## SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted in August, 2014. A total of six (6) test holes were drilled with a conventional, truck-mounted, drilling rig to evaluate the subsurface conditions as well as to retrieve samples for laboratory testing and analysis. Test holes 1, 3, and 6 were advanced to depths of about 20 to 31 feet in the general building footprints. Test holes 2, 4, and 5 were drilled in the parking lot, skate area, and hard court area, respectively, to depths of about 5 to 15 feet. A GROUND engineer directed the subsurface exploration, logged the test holes in the field, and prepared the samples for transport to our laboratory.

Samples of the subsurface materials were retrieved with a 2-inch I.D. 'California' liner sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches, a procedure similar to that described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depths at which the samples were obtained and associated penetration resistance values are shown on the test hole logs.

The approximate locations of the test holes are shown on Figure 1. Logs of the test holes are presented on Figures 2 and 3. Explanatory notes and a legend are provided on Figure 4.

## LABORATORY TESTING

Samples retrieved from our test holes were examined and visually classified in the laboratory by the project engineer. Laboratory testing of soil samples included standard property tests, such as natural moisture contents, dry unit weights, hydrometer analyses, and Atterberg limits. Water-soluble sulfate and a suite of corrosivity tests were completed on selected samples, as well. Resilient modulus testing was performed on a composite (bulk) sample of soils from Test Hole 2. Laboratory tests were performed in general accordance with applicable ASTM and AASHTO protocols. Results of the laboratory testing program are summarized in Tables 1 and 2. A gradation plot is provided on Figure 5.

## SUBSURFACE CONDITIONS

The test holes penetrated sandy native soils that extended to depths of 20 to 22 feet. Bedrock claystones underlay the native soils and extended to the depths explored.

It should be noted that coarse gravel and cobbles are not well represented in samples obtained from small diameter test holes. At this site, therefore, it should be anticipated that gravel and possibly cobbles may be present in the native soils, even where not included in the general descriptions of the site soil types below.

**Sands** ranged from clayey to silty sands. Lenses of sandy clays and clays were noted locally within the sands. They were moist to wet, non-plastic to medium plastic, medium dense, and brown to dark-brown to gray in color.

**Bedrock** consisted of claystone. It was highly plastic with fine grains, moist, medium hard to hard, gray to green gray to brownish yellow color.

**Groundwater** was encountered in several test holes at depths of about 10 to 17 feet below existing grades at the time of drilling. Groundwater was noted at depths between 6.7 feet and 8.5 feet upon re-measurement four days after drilling.

Groundwater levels can be expected to fluctuate, however, in response to annual and longer-term cycles of precipitation, irrigation, surface drainage, land use, and the development of transient, perched water conditions.

***Swell-Consolidation Testing*** indicated hydro-consolidation of approximately 1% at surcharges similar to overburden and footing loads.

## **SEISMIC CLASSIFICATION**

Based on extrapolation of available data to depth and our experience in the project area, we consider the site likely to meet the criteria for a Seismic Site Classification of D according to the 2012 IBC classification (Table 1613.5.2). Exploration and/or shear wave velocity testing to a depth of 100 feet or more was not part of our present scope of services. To evaluate the Seismic Site Classification quantitatively, or if a higher site class, e.g., Site Class C, is preferred for design – if available – then according to the 2012 IBC, seismic shear wave velocity testing and/or exploration to depths of at least 100 feet should be performed. We consider the likelihood of achieving a Site Classification of C at the subject location to be low.

The USGS's Earthquake Ground Motion Tool v.5.0.9a indicated an SDs value of 0.218g and an SD<sub>1</sub> value of 0.087g for the site's latitude/longitude coordinates and Seismic Site Class of D.

## **GEOTECHNICAL CONSIDERATIONS FOR DESIGN**

The native soils underlying the site generally consisted of granular soils that are nominally capable of supporting the proposed improvements. However the soils exhibited some potential for hydro-consolidation or “collapse.”

Where foundations, floors, exterior flatwork and other elements are supported directly on the existing, undocumented fill soils, we estimate likely post-construction settlements will be about 1½ inches, with similar differential movements over spans of about 40 feet. Lateral displacements will be realized, as well. The anticipated movements can result in damage to the proposed improvements as well as other improvements on the site. “Maximum possible” movement estimates necessarily will be larger than those presented herein. They also have a significantly lower likelihood of being realized in our



opinion, and generally require more expensive measures to address. We encourage DHM Design, upon receipt of this report, to discuss these risks and the geotechnical alternatives with us.

The proposed structures can be supported on conventional, shallow foundations, together with slab-on-grade, concrete floors, with a reduced estimate of likely settlement if placed on a section of properly compacted fill soils. If footings bear on a section of properly compacted fill at least 3 feet in thickness, and effective drainage is established and maintained, we estimate that likely post-construction, foundation movements will be on the order of 1 inch, with similar differential movements over spans of about 40 feet. Similarly, likely vertical, floor movements also will be about 1 inch with similar differential movements over spans of about 40 feet where slabs bear on 5 or more feet of properly compacted fill. More detailed parameters for design and construction of a shallow, spread footing foundation system and a slab-on-grade floor are provided in the *Foundation System* and *Floor System* sections of this report.

## **FOUNDATION SYSTEMS**

### ***Geotechnical Parameters for Shallow Foundation Design***

- 1) Footings should bear on **3 or more feet** of properly compacted fill soils.

The fill section should extend should extend at full thickness across the building footprint and at least 3 feet laterally beyond the building perimeter.

Considerations for fill placement and compaction are provided in the *Project Earthwork* section of this report.

The fill section beneath the building should be laterally consistent and of uniform depth to reduce differential, post-construction foundation movements. A differential fill section will tend to increase differential movements.

The contractor should provide survey data of the excavation beneath each building indicating the depth and lateral extents of the remedial excavation.

- 2) Footings bearing on a properly placed and compacted fill section, as described herein, may be designed for an allowable soil bearing pressure of **2,500 psf** for

footings **up to 6 feet in width** (least lateral dimension). This value may be increased by  $\frac{1}{3}$  for transient loads such as wind or seismic loading. For larger footings, a lower allowable bearing pressure may be appropriate.

The estimated 1 inch of likely, post-construction settlement associated with this fill section and allowable bearing pressure is based on an assumption of effective site drainage. If foundation soils are subjected to an increase/fluctuation in moisture content, the effective bearing capacity will be reduced and greater post-construction movements than those estimated above may result.

In order to reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle differentially.

- 3) Spread footings should have a minimum lateral dimension of **16 or more inches** for linear strip footings and **24 or more inches** for isolated pad footings. Actual footing dimensions, however, should be determined by the structural engineer.
- 4) Footings should bear at an elevation **3 or more feet** below the lowest adjacent exterior finish grades to have adequate soil cover for frost protection. Interior footings in heated areas not subject to frost heave should bear at a depth of at least  $1\frac{1}{2}$  feet below adjacent, exterior grades, however.
- 5) Continuous foundation walls should be reinforced top and bottom to span an unsupported length of at least **10 feet**.
- 6) Geotechnical parameters for lateral resistance to foundation loads are provided in the *Lateral Loads* section of this report.
- 7) Connections to the building of all types must be flexible and/or adjustable to accommodate the anticipated, post-construction movements.

#### ***Shallow Foundation Construction Considerations***

- 8) The contractor should take adequate care when making excavations not to compromise the bearing or lateral support for nearby improvements.



- 9) Care should be taken when excavating the foundations to avoid disturbing the supporting materials. Hand excavation or careful backhoe soil removal may be required in excavating the last few inches.
- 10) Footing excavation bottoms may expose loose, organic or otherwise deleterious materials, including debris. Firm materials may become disturbed by the excavation process. All such unsuitable materials should be excavated and replaced with properly compacted fill.
- 11) Foundation soils may be disturbed or deform excessively under the wheel loads of heavy construction vehicles as the excavations approach footing bearing levels. Construction equipment should be as light as possible to limit development of this condition. Track-mounted vehicles generally should be used because they exert lower contact pressures. The movement of vehicles over proposed foundation areas should be restricted.
- 12) All footing areas should be compacted with a vibratory plate compactor prior to placement of concrete.
- 13) Compacted fill placed against the sides of the footings should be compacted in accordance with the criteria in the *Project Earthwork* section of this report.

## **FLOOR SYSTEMS AND EXTERIOR SLABS ON GRADE**

### ***Geotechnical Parameters for Design of Slabs-on-Grade***

- 1) A slab-on-grade floor for a structure should bear on a section of properly compacted fill at least **5 feet** in thickness.

The remedial fill section should extend at full depth 3 or more feet laterally beyond the slab perimeter.

The thickness of the re-worked section should be taken from the bottom of the slab + gravel layer system. (If the gravel layer is not installed, the re-worked section should be correspondingly thickened.)

Criteria and compaction standards for fill placement and compaction are provided in the *Project Earthwork* section of this report.

- 2) We assume that slabs on grade for ball courts and skating areas are more tolerant of movement than slab on grade floors for structures. Therefore, such slabs on grade may bear on a section of properly compacted fill at least **2 feet** in thickness.

The remedial fill section should extend at full depth 2 or more feet laterally beyond the slab perimeter.

However, for performance like for a structure slab on grade, a 5-foot fill section would be required.

- 3) Slabs on grade should be adequately reinforced. Floor slab design, including slab thickness, concrete strength, jointing, and slab reinforcement should be developed by a structural engineer.
- 4) A vertical modulus of subgrade reaction ( $K_v$ ) of **130 tcf** (150 pci) may be used for design of a concrete slab-on-grade bearing on properly compacted, granular fill.
- 5) Floor slabs should be separated from all bearing walls and columns with slip joints, which allow unrestrained vertical movement.

Slip joints should be observed periodically, particularly during the first several years after construction. Slab movement can cause previously free-slipping joints to bind. Measures should be taken to assure that slab isolation is maintained in order to reduce the likelihood of damage to walls and other interior improvements.

- 6) Concrete slabs-on-grade should be provided with properly designed control joints.

ACI, AASHTO and other industry groups provide guidelines for proper design and construction concrete slabs-on-grade and associated jointing. The design and construction of such joints should account for cracking as a result of shrinkage, curling, tension, loading, and curing, as well as proposed slab use. Joint layout based on the slab design may require more frequent, additional, or deeper joints, and should reflect the configuration and proposed use of the slab.

Particular attention in slab joint layout should be paid to areas where slabs consist of interior corners or curves (e.g., at column blockouts or reentrant

corners) or where slabs have high length to width ratios, significant slopes, thickness transitions, high traffic loads, or other unique features. The improper placement or construction of control joints will increase the potential for slab cracking.

- 7) Interior partitions resting on floor slabs should be provided with slip joints so that if the slabs move, the movement cannot be transmitted to the upper structure. This detail is also important for wallboards and doorframes. Slip joints which will allow **1½ inches or more** of differential vertical movement should be considered. Accommodation for differential movement also should be made where partitions meet bearing walls.
- 8) Post-construction soil movements may not displace slab-on-grade floors and utility lines in the soils beneath them to the same extent. Design of floor penetrations, connections, and fixtures should accommodate at least **2 inches** of differential movement.
- 9) Moisture can be introduced into a slab subgrade during construction and additional moisture will be released from the slab concrete as it cures. A properly compacted layer of free-draining gravel, 4 or more inches in thickness, should be placed beneath the slabs. This layer will help distribute floor slab loadings, ease construction, reduce capillary moisture rise, and aid in drainage.

The free-draining gravel should contain less than 5 percent material passing the No. 200 Sieve, more than 50 percent retained on the No. 4 Sieve, and a maximum particle size of 2 inches.

The capillary break and the drainage space provided by the gravel layer also may reduce the potential for excessive water vapor fluxes from the slab after construction as mix water is released from the concrete.

We understand, however, that professional experience and opinion differ with regard to inclusion of a free-draining gravel layer beneath slab-on-grade floors. If these issues are understood by the owner and appropriate measures are implemented to address potential concerns including slab curling and moisture fluxes, then the gravel layer may be deleted.

In addition, use and placement of a free-draining gravel system should be coordinated with design and construction of the methane mitigation system for the building.

- 10) A vapor barrier beneath a slab can be beneficial with regard to reducing exterior moisture moving into the building, through the slab, but can retard downward drainage of construction moisture. Uneven moisture release can result in slab curling. Elevated vapor fluxes can be detrimental to the adhesion and performance of many floor coverings and may exceed various flooring manufacturers' usage criteria.

Per the 2006 ACI *Location Guideline*, a vapor barrier is required under concrete floors when that floor is to receive moisture-sensitive floor covering and/or adhesives, or the room above that floor has humidity control.

Therefore, in light of the several, potentially conflicting effects of the use vapor-barriers, the owner and the architect and/or contractor should weigh the performance of the slab and appropriate flooring products in light of the intended building use, etc., during the floor system design process and the selection of flooring materials. Use of a plastic vapor-barrier membrane may be appropriate for some building areas and not for others.

In the event a vapor barrier is utilized, it generally should consist of a minimum 15 mil thickness, extruded polyolefin plastic (no recycled content or woven materials), maintain a permeance less than 0.01 perms per ASTM E-96 or ASTM F-1249, and comply with ASTM E-1745 (Class "A"). Vapor barriers should be installed in accordance with ASTM E-1643.

Polyethylene ("poly") sheeting (even if 15 mils in thickness which polyethylene sheeting commonly is not) does not meet the ASTM E-1745 criteria and generally should not be used as vapor barrier material. It can be easily torn and/or punctured, does not possess necessary tensile strength, gets brittle, tends to decompose over time, and has a relatively high permeance.

### ***Construction Considerations for Slabs-on-Grade***

- 11) Loose, soft, or otherwise unsuitable materials exposed on the prepared surface on which a slab will be cast should be excavated and replaced with properly compacted fill.
- 12) The fill section beneath a slab should be of uniform thickness.
- 13) Concrete slabs should be constructed and cured in accordance with applicable industry standards and slab design specifications.
- 14) All plumbing lines should be carefully tested before operation. Where plumbing lines enter through the floor, a positive bond break should be provided.

### **LATERAL LOADS**

***Shallow Foundations Resisting Lateral Loads*** Footings and similar elements designed for frictional resistance to lateral loads may be designed using a friction coefficient between the foundation element and the site soils of **0.4**.

Passive soil pressure may be estimated at this site using an equivalent fluid pressure of **390 pcf** for drained conditions, to a **maximum of 3,900 psf**. The upper 1 foot of embedment should be neglected for passive resistance, however. Where this passive soil pressure is used to resist lateral loads, it should be understood that significant lateral strains will be required to mobilize the full value indicated above, likely 1 inch or more. A reduced passive pressure can be used for reduced anticipated strains, however.

Note that the values indicated above (and preliminarily, below) were based on a moist unit weight ( $\gamma$ ) of 120 pcf and an angle of internal friction ( $\phi$ ) of 32 degrees for the shallow, on-site soils and are un-factored. Appropriate factors of safety should be included in design calculations.

### ***Preliminary At-Rest and Active Lateral Earth Pressures for Retaining Walls***

We are not aware that retaining walls are planned at this time as part of the proposed facility improvements. Preliminary 'active' and 'at-rest' equivalent fluid pressures are provided below for initial wall cost estimates, based on the unit weight and angle of internal friction noted above. They assume that on-site soils will be used as wall backfill, conditions will be well-drained, and that the backfill surface will be horizontal. In the

event that retaining walls are added once project design begins, a geotechnical engineer should be retained to develop parameters for retaining wall parameter design. Global stability analysis may be needed, as well. DHM Design and the City of Commerce City should realize that additional subsurface exploration and laboratory testing may be necessary.

Preliminary Equivalent

<u>Condition</u>	<u>Fluid Pressure</u>
Active:	37 pcf
At-Rest:	57 pcf

Actual wall design should incorporate any upward sloping backfills, live loads such as construction equipment, material stockpiles, etc., and other surcharge pressures. The build-up of hydrostatic pressures behind a wall also will increase lateral earth pressures on the walls.

## **WATER-SOLUBLE SULFATES**

The concentration of water-soluble sulfates measured in samples of site soils ranged up to approximately 0.02 percent by weight. (See Table 2.) Such concentrations of soluble sulfates represent a negligible environment for sulfate attack on concrete exposed to these materials. Degrees of attack are based on the scale of 'negligible,' 'moderate,' 'severe' and 'very severe' as described in the "Design and Control of Concrete Mixtures," published by the Portland Cement Association (PCA). The Colorado Department of Transportation (CDOT) utilizes a corresponding scale with four classes of severity of sulfate exposure (Class 0 to Class 3) as described in the table below.

REQUIREMENTS TO PROTECT AGAINST DAMAGE TO  
CONCRETE BY SULFATE ATTACK FROM EXTERNAL SOURCES OF SULFATE

Severity of Sulfate Exposure	Water-Soluble Sulfate ( $\text{SO}_4^{=}$ ) In Dry Soil (%)	Sulfate ( $\text{SO}_4^{=}$ ) In Water (ppm)	Water / Cementitious Ratio (maximum)	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1,500	0.45	Class 1
Class 2	0.21 to 2.00	1,501 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,001 or greater	0.40	Class 3

Based on these data, no special, sulfate-resistant cement need be used in project concrete.

## SOIL CORROSIVITY

Data were obtained to support an initial assessment of the potential for corrosion of ferrous metals in contact with earth materials at the site, based on the conditions at the time of GROUND's evaluation. The test results are summarized in Table 2.

**pH** Where pH is less than 4.0, soil serves as an electrolyte; the pH range of about 6.5 to 7.5 indicates soil conditions that are optimum for sulfate reduction. In the pH range above 8.5, soils are generally high in dissolved salts, yielding a low soil resistivity.<sup>2</sup> Testing indicated a pH value of about 8.1.

**Soil Resistivity** In order to assess the "worst case" for mitigation planning, samples of materials retrieved from the test holes were tested for resistivity in the laboratory, after being saturated with water, rather than in the field. Resistivity also varies inversely with temperature. Therefore, the laboratory measurements were made at a controlled temperature. Measurement of electrical resistivity indicated a value of approximately 1,282 ohm-centimeters in a sample of site soils.

**Reduction-Oxidation** testing indicated a red-ox potential of -79 millivolts. Such a low potential typically creates a more corrosive environment.

**Sulfide Reactivity** testing indicated a 'trace' results in the local soils. The presence of sulfides in the soils suggests a more corrosive environment.

**Corrosivity Assessment** The American Water Works Association (AWWA) has developed a point system scale used to predict corrosivity. The scale is intended for protection of ductile iron pipe but is valuable for project steel selection. When the scale equals 10 points or higher, protective measures for ductile iron pipe are indicated. The AWWA scale is presented below. The soil characteristics refer to the conditions at and above pipe installation depth.

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<sup>2</sup> American Water Works Association ANSI/AWWA C105/A21.5-05 Standard

**Table A.1 Soil-test Evaluation**

<u>Soil Characteristic / Value</u>	<u>Points</u>
<b>Redox Potential</b>	
< 0 (negative values) .....	5
0 to +50 mV .....	4
+50 to +100 mV .....	3½
> +100 mV .....	0
<b>Sulfide Reactivity</b>	
Positive .....	3½
Trace .....	2
Negative .....	0
<b>Soil Resistivity</b>	
<1,500 ohm-cm .....	10
1,500 to 1,800 ohm-cm .....	8
1,800 to 2,100 ohm-cm .....	5
2,100 to 2,500 ohm-cm .....	2
2,500 to 3,000 ohm-cm .....	1
>3,000 ohm-cm .....	0
<b>pH</b>	
0 to 2.0 .....	5
2.0 to 4.0 .....	3
4.0 to 6.5 .....	0
6.5 to 7.5 .....	0 *
7.5 to 8.5 .....	0
>8.5 .....	3
<b>Moisture</b>	
Poor drainage, continuously wet .....	2
Fair drainage, generally moist .....	1
Good drainage, generally dry .....	0

\* If sulfides are present and low or negative redox-potential results (< 50 mV) are obtained, add three (3) points for this range.

We anticipate that drainage at the site after construction will be effective. Nevertheless, based on the values obtained for the soil parameters, the overburden soils and bedrock appear to comprise a highly corrosive environment for ferrous metals (17 points).

If additional information or evaluation are needed regarding soil corrosivity, then the American Water Works Association or a corrosion engineer should be contacted. It should be noted, however, that changes to the site conditions during construction, such as the import of other soils, or the intended or unintended introduction of off-site water, might alter corrosion potentials significantly.



## PROJECT EARTHWORK

The earthwork criteria below are based on our interpretation of the geotechnical conditions encountered in the test holes. Where these criteria differ from applicable municipal specifications, e.g., for subgrade compaction along a publicly maintained roadway, the latter should be considered to take precedence.

**General Considerations** Project grading should be performed as early as possible in the construction sequence to allow settlement of fills and surcharged ground to be realized to the greatest extent prior to subsequent construction.

All undocumented fill soils, if encountered, should be excavated in their entirety and replaced with properly compacted fill. Even where grades are to be raised, any existing fills in those areas still should be excavated fully and replaced with properly compacted fill.

Prior to earthwork construction, existing construction debris, vegetation and other deleterious materials should be removed and disposed of off-site. Relic underground utilities should be abandoned in accordance with applicable regulations, removed as necessary, and properly capped. Prairie dog tunnels should be collapsed and backfilled effectively to avoid locally differential settlements.

**Use of Existing Fill Soils** Fill soils were not recognized in the test holes, but may exist on site. In general, we anticipate that most fill soils will be suitable for re-use as compacted fill. Because they were not sampled and tested, however, it is possible that some existing fill materials when excavated may not be suitable for re-use as compacted fill, including trash, organic material, coarse cobbles and boulders, and construction debris. Excavated fill materials should be evaluated and tested, as appropriate, with regard to re-use

Cobbles and fragments of rock, as well as inert construction debris, e.g., concrete or asphalt, up to 6 inches in maximum dimension may be included in project fills, in general. Such materials should be evaluated on a case-by-case basis where identified during earthwork.

***Use of Native Site Soils*** Based on the samples retrieved from the test holes, we anticipate that the existing site soils free of organic materials, coarse cobbles, boulders, or other deleterious materials will be suitable, in general, for re-use as compacted fill.

***Imported Fill Materials*** Materials imported to the site as fill should be free of organic material, and other deleterious materials. Imported material should exhibit 35 percent or less passing the No. 200 Sieve and a plasticity index of 10 or less. Materials proposed for import should be approved prior to transport to the site.

***Fill Platform Preparation*** Prior to filling, the top 12 inches of in-place materials on which fill soils will be placed (except for utility trench bottoms where bedding will be placed) should be scarified, moisture conditioned and properly compacted in accordance with the criteria below to provide a uniform base for fill placement.

If surfaces to receive fill expose loose, wet, soft, or otherwise deleterious material, additional material should be excavated, or other measures taken to establish a firm platform for filling. A surface to receive fill must be firm and effectively stable prior to placement of fill.

The stabilization approach should be determined by the contractor, but GROUND offers the alternatives below for consideration.

- Replacement of the existing subgrade soils with clean, coarse, aggregate (e.g., crushed rock or “pit run” materials) or road base. Excavation and replacement to a depth of 1 to 2 feet commonly is sufficient, but greater depths may be necessary to establish a stable surface.

On very weak subgrades, an 18- to 24-inch “pioneer” lift that is not well compacted may be beneficial to stabilize the subgrade. Where this approach is employed, however, additional settlements of up to ½ inch may result.

- 1) Where coarse, aggregate alone does not appear sufficient to provide stable conditions, it can be beneficial to place a layer of stabilization geo-textile or geo-grid (e.g., Tencate Mirafi® RS 580i, or Tensar® BX 1100) at the base of the aggregate section.

The stabilization geo-textile / geo-grid should be selected based on the aggregate proposed for use. It should be placed and lapped in accordance with the manufacturer's recommendations.

Geo-textile or geo-grid products can be disturbed by the wheels or tracks of construction vehicles. We suggest that appropriate care be taken to maintain the effectiveness of the system. Placement of a layer of aggregate over the geo-textile / geo-grid prior to allowing vehicle traffic over it can be beneficial in this regard.

When a given remedial approach has been selected, a test section should be constructed to evaluate the effectiveness of the approach prior to use over a larger area.

***General Considerations for Fill Placement*** Fill soils should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted. No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Where soils supporting foundations or on which foundation will be placed are exposed to freezing temperatures or repeated freeze – thaw cycling during construction – commonly due to water ponding in foundation excavations – bearing capacity typically is reduced and/or settlements increased due to the loss of density in the supporting soils. After periods of freezing conditions, the contractor should re-work areas affected by the formation of ice to re-establish adequate bearing support.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. Materials that are not properly moisture conditioned may exhibit significant pumping, rutting, and deflection at moisture contents near optimum and above. The contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Compaction areas should be kept separate, and no lift should be covered by another until relative compaction and moisture content within the specified ranges are obtained.

***Compaction Standards*** Fill soils should be compacted to 95 percent or more of the maximum dry density at moisture contents within 2 percent of the optimum moisture content as determined by ASTM D1557, the 'modified Proctor.'

The contractor should be aware that the clays and silts encountered locally at this site can be sensitive to moisture content and compacting them in accordance with this criterion may be relatively difficult. Therefore, it may be cost-effective for the contractor to export such soils and replacement with sands meeting the criteria above for imported fill.

**Use of Squeegee** Relatively uniformly graded fine gravel or coarse sand, i.e., “squeegee,” or similar materials commonly are proposed for backfilling foundation excavations, utility trenches (excluding approved pipe bedding), and other areas where employing compaction equipment is difficult. In general, this procedure should not be followed for the following reasons:

Although commonly considered “self compacting,” uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are permeable and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

Wherever possible, excavations should be backfilled with approved, on-site soils placed as properly compacted fill. Where this is not feasible, use of “Controlled Low Strength Material” (CLSM), i.e., a lean, sand-cement slurry (“flowable fill”) or a similar material for backfilling should be considered.

Where “squeegee” or similar materials are proposed for use by the Contractor, the design team should be notified by means of a Request for Information (RFI), so that the proposed use can be considered on a case-by-case basis. Where “squeegee” meets the project requirements for pipe bedding material, however, it is acceptable for that use.

**Settlements** Settlements will occur in filled ground, typically on the order of 1 to 2 percent of the fill depth. For a 3-foot fill, for example, that corresponds to a total settlement of about ½ inch. If fill placement is performed properly and is tightly controlled, in GROUND’s experience the majority (on the order of 60 to 80 percent) of that settlement typically will take place during earthwork construction, provided the

contractor achieves the compaction levels indicated herein. The remaining potential settlements likely will take several months or longer to be realized, and may be exacerbated if these fills are subjected to changes in moisture content.

**Cut and Filled Slopes** Permanent, graded slopes supported by local soils up to 5 feet in height should be constructed no steeper than 3:1 (horizontal : vertical). Minor raveling or surficial sloughing should be anticipated on slopes cut at this angle until vegetation is well re-established. Surface drainage should be designed to direct water away from slope faces into designed drainage pathways or structures.

## **EXCAVATION CONSIDERATIONS**

**Excavation Difficulty** Test holes for the subsurface exploration were advanced to the depths indicated on the test hole logs by means of conventional, truck-mounted, geotechnical drilling equipment. We anticipate no unusual excavation difficulties in these materials, in general, for the proposed construction with conventional, heavy duty, excavating equipment.

**Temporary Excavations and Personnel Safety** Excavations in which personnel will be working must comply with all applicable OSHA Standards and Regulations, particularly CFR 29 Part 1926, OSHA Standards-Excavations, adopted March 5, 1990. The contractor's "responsible person" should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. GROUND has provided the information in this report solely as a service to DHM Design, and is not assuming responsibility for construction site safety or the contractor's activities.

The contractor should take care when making excavations not to compromise the bearing or lateral support for any adjacent, existing improvements.

Temporary, un-shored excavation slopes up to 10 feet in height, in general, should be cut no steeper than 2:1 (horizontal : vertical) in the on-site soils in the absence of seepage. Some surface sloughing may occur on the slope faces at these angles. Should site constraints prohibit the use of the above-indicated slope angle, temporary shoring should be used. GROUND is available to provide shoring design upon request.

**Groundwater and Surface Water** Groundwater was encountered at depths of as shallow as about 6½ feet below existing grades. Therefore, shallow groundwater may be encountered in excavations deeper than about 5 feet, i.e., in some remedial excavations beneath structures. It may be necessary to de-water these excavations. It also may be possible to reduce the depth of remedial earthwork where wet soils or groundwater are encountered. A geotechnical engineer should be retained to evaluate such cases.

Should seepage or flowing groundwater be encountered in project excavations, the slopes should be flattened as necessary to maintain stability or a geotechnical engineer should be retained to evaluate the conditions. The risk of slope instability will be significantly increased in areas of seepage along excavation slopes.

The contractor should take pro-active measures to control surface waters during construction and maintain good surface drainage conditions to direct waters away from excavations and into appropriate drainage structures. A properly designed drainage swale should be provided at the tops of the excavation slopes. In no case should water be allowed to pond near project excavations.

Temporary slopes should also be protected against erosion. Erosion along the slopes will result in sloughing and could lead to a slope failure.

## **UTILITY LATERAL INSTALLATION**

The measures and criteria below are based on GROUND's evaluation of the local, geotechnical conditions. Where the parameters herein differ from applicable municipal requirements, the latter should be considered to govern.

**Pipe Support** The bearing capacity of the site soils appeared adequate, in general, for support of typical utility lines. The pipes + contents are less dense than the soils which will be displaced for installation. Therefore, GROUND anticipates no significant pipe settlements in these materials where properly bedded. However, at least locally at the site, collapsible soils are present which could result in pipe settlements if they become wetted beneath a pipe.

Excavation bottoms may expose soft, loose or otherwise deleterious materials. Firm materials may be disturbed by the excavation process. All such unsuitable materials

should be excavated and replaced with properly compacted fill. Areas allowed to pond water will require excavation and replacement with properly compacted fill. The contractor should take particular care to ensure adequate support near pipe joints which are less tolerant of extensional strains.

Where thrust blocks are needed, the parameters provided in the *Lateral Loads* section of this report may be used for design.

***Trench Backfilling*** Some settlement of compacted soil trench backfill materials should be anticipated, even where all the backfill is placed and compacted correctly. Typical settlements are on the order of 1 to 2 percent of fill thickness. However, the need to compact to the lowest portion of the backfill must be balanced against the need to protect the pipe from damage from the compaction process. Some thickness of backfill may need to be placed at compaction levels lower than specified (or smaller compaction equipment used together with thinner lifts) to avoid damaging the pipe. Protecting the pipe in this manner can result in somewhat greater surface settlements. Therefore, although other alternatives may be available, the following options are presented for this project:

***Controlled Low Strength Material*** Because of the above considerations, the entire depth of the trench should be backfilled (both bedding and common backfill zones) with “controlled low strength material” (CLSM), i.e., a lean, sand-cement slurry, “flowable fill,” or a similar material (e.g., air-entrained “flash fill”) along all trench alignment reaches with low tolerances for surface settlements.

CLSM used as pipe bedding and trench backfill should exhibit a 28-day unconfined compressive strength between 50 to 150 psi so that re-excavation is not unusually difficult. The contractor should establish design mix and a quality control program to facilitate keeping the CLSM strengths within this range.

Placement of the CLSM in several lifts or other measures likely will be necessary to avoid ‘floating’ the pipe. Measures also should be taken to maintain pipe alignment during CLSM placement.

***Compacted Soil Backfilling*** As a higher risk alternative for reaches that are tolerant of surface settlements, the utility trenches may be backfilled with compacted soil using the on-site soils or similar materials. Where compacted soil backfilling is employed as

backfill, the risk of trench backfill settlements entailed must be anticipated and accepted by DHM Design and the Owner.

We anticipate that the on-site soils excavated from trenches will be suitable, in general, for use as common trench backfill within the above-described limitations. Backfill soils should be free of vegetation, organic debris and other deleterious materials. Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) coarser than 6 inches in maximum dimension should not be incorporated into trench backfills.

If it is necessary to import material for use as backfill, the imported soils should be free of vegetation, organic debris, and other deleterious materials and meet the criteria for imported soils provided in the *Project Earthwork* section of this report.

Soils placed for compaction as trench backfill should be conditioned to a relatively uniform moisture content, placed and compacted in accordance with the criteria in the *Project Earthwork* section of this report.

**Pipe Bedding** Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. Bedding should be brought up uniformly on both sides of the pipe to reduce differential loadings.

As discussed above, we CLSM or similar material should be used in lieu of granular bedding and compacted soil backfill where the tolerance for surface settlement is low. (Placement of CLSM as bedding to at least 12 inches above the pipe can protect the pipe and assist construction of a well-compacted conventional backfill, although possibly at an increased cost relative to the use of conventional bedding.)

If a granular bedding material is specified, then with regard to potential migration of fines into the pipe bedding, design and installation should follow ASTM D2321, Appendix X1.8. If the granular bedding does not meet filter criteria for the enclosing soils, then non-woven filter fabric (e.g., TenCate Mirafi® 140N, or the equivalent) should be placed around the bedding to reduce migration of fines into the bedding which can result in severe, local surface settlements. Where this protection is not provided, settlements can develop/continue several months or years after completion of the project.

In addition, clay or concrete cut-off walls should be installed at the margins of the pad to interrupt the granular bedding section to reduce the rates and volumes of water



transmitted along utility alignments which can contribute to migration of fines. We anticipate that cut-off walls also will be beneficial with regard to limiting migration of methane along the pipe bedding.

If granular bedding is specified, some local soils may be suitable with processing for this purpose. Materials proposed for use as pipe bedding should be tested for suitability prior to use. Imported materials should be approved prior to transport to the site.

**Other Considerations** Because of the potential for collapsible soil settlements to result in significant, extensional strains to utility pipes, pipes should be provided with restrained joints to reduce the potential for failure at joints. Connections to the building or other structures on deep foundations should be flexible and easily replaced or adjusted. Non-pressurized lines should be evaluated periodically for deformations such as pipe 'bellies' that would impair their efficiency, and appropriate repairs made. Maintenance plans should anticipate greater than typical utility line maintenance and replacement.

## **SURFACE DRAINAGE**

The site soils are relatively stable with regard to moisture content – volume relationships at their existing moisture contents. Other than the anticipated, post-placement settlement of fills, post-construction soil movements will result primarily from the introduction of water into the soils underlying the proposed structure, hardscaping and pavements. Wetting of the soils may result from infiltrating surface waters (precipitation, irrigation, etc.), water flowing along constructed pathways such as bedding in utility pipe trenches, or a rise in the local water table.

The following drainage measures should be followed both for during construction and as part of project design. The facility should be observed periodically to evaluate the surface drainage and identify areas where drainage is ineffective. Routine maintenance of site drainage should undertaken throughout the design life of the proposed facility. If these measures are not implemented and maintained effectively, the movement estimates provided in this report could be exceeded.

- 1) Wetting or drying of the foundation excavations and underslab areas should be avoided during and after construction as well as throughout the improvements' design life. Permitting increases/variations in moisture to the adjacent or

supporting soils may result in a decrease in bearing capacity and an increase in volume change of the underlying soils, and increased total and/or differential movements.

- 2) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils.

The ground surface surrounding the exterior of each building should be sloped to drain away from the foundation in all directions. A minimum slope of 12 inches in the first 10 feet should be incorporated in the areas not covered with pavement or concrete slabs, or a minimum 3 percent in the first 10 feet in the areas covered with pavement or concrete slabs. Reducing the slopes to comply with ADA requirements may be necessary by other design professionals but may entail an increased potential for moisture infiltration and subsequent volume change of the underlying soils and resultant distress.

In no case should water be allowed to pond near or adjacent to foundation elements, hardscaping, utility trench alignments, etc.

It should be noted that the maintenance necessary to maintain effective surface drainage may include removal and replacement of improvements, local earthwork to restore drainage gradients, etc.

- 3) Drainage should be established and maintained to direct water away from sidewalks and other hardscaping as well as utility trench alignments. Where the ground surface does not convey water away readily, additional post-construction movements and distress should be anticipated.
- 4) In GROUND's experience, it is common during construction that in areas of partially completed paving or hardscaping, bare soil behind curbs and gutters, and utility trenches, water is allowed to pond after rain or snow-melt events. Wetting of the subgrade can result in loss of subgrade support and increased settlements / increased heave. By the time final grading has been completed, significant volumes of water can already have entered the subgrade, leading to subsequent distress and failures. The contractor should maintain effective site

drainage throughout construction so that water is directed into appropriate drainage structures.

- 5) Roof downspouts and drains should discharge well beyond the perimeter of the structure foundations (minimum 10 feet) and backfill zones and be provided with positive conveyance off-site for collected waters.
- 6) Based on our experience with similar facilities, the project may include landscaping/watering near site improvements. Irrigation water – both that applied to landscaped areas and over-spray – is a significant cause of distress to improvements. To reduce the potential for such distress, vegetation requiring watering should be located 10 or more feet from building perimeters, flatwork, or other improvements. Irrigation sprinkler heads should be deployed so that applied water is not introduced near or into foundation/subgrade soils. Landscape irrigation should be limited to the minimum quantities necessary to sustain healthy plant growth.
- 7) Use of drip irrigation systems can be beneficial for reducing over-spray beyond planters. Drip irrigation can also be beneficial for reducing the amounts of water introduced to foundation/subgrade soils, but only if the total volumes of applied water are controlled with regard to limiting that introduction. Controlling rates of moisture increase beneath the foundations, floors, and other improvements should take higher priority than minimizing landscape plant losses.

Where plantings are desired within 10 feet of a building, it is GROUND's opinion that the plants be placed in water-tight planters, constructed either in-ground or above-grade, to reduce moisture infiltration in the surrounding subgrade soils. Planters should be provided with positive drainage and landscape underdrains. As an alternative involving a limited increase in risk, the use of water-tight planters may be replaced by local shallow underdrains beneath the planter beds. Colorado Geological Survey – Special Publication 43 provides additional guidelines for landscaping and reducing the amount of water that infiltrates into the ground.

GROUND understands many municipalities require landscaping within 10 feet of building perimeters. Provided that positive, effective surface drainage is initially

implemented and maintained throughout the life of the facility and the Owner understands and accepts the risks associated with this requirement, vegetation that requires little to no watering may be located within 10 feet of the building perimeter.

- 8) Inspections must be made by facility representatives to make sure that the landscape irrigation is functioning properly throughout operation and that excess moisture is not applied.
- 9) Plastic membranes should not be used to cover the ground surface adjacent to the building as soil moisture tends to increase beneath these membranes. Perforated “weed barrier” membranes that allow ready evaporation from the underlying soils may be used.

Cobbles or other materials that tend to act as baffles and restrict surface flow should not be used to cover the ground surface near the foundations.

## **SUBSURFACE DRAINAGE**

As a component of project civil design, properly functioning, subsurface drain systems (underdrains) can be beneficial for collecting and discharging saturated subsurface waters. Underdrains will not collect water infiltrating under unsaturated (vadose) conditions, or moving via capillarity, however. In addition, if not properly constructed and maintained, underdrains can transfer water into foundation soils, rather than remove it. This will tend to induce heave or settlement of the subsurface soils, and may result in distress. Underdrains can, however, provide an added level of protection against relatively severe post-construction movements by draining saturated conditions near individual structures should they arise, and limiting the volume of wetted soil.

However, if below-grade or partially below-grade level(s) are added to a structure, then damp-proofing should be applied to the exteriors of below-grade elements. The provision of Tencate MiraFi® G-Series backing (or comparable wall drain provisions) on the exteriors of (some) below-grade elements may be appropriate, depending on the intended use. If a (partially) below-grade level is limited in extent, it may be efficient to install a separate, local underdrain system, in that area.

***Geotechnical Parameters for Underdrain Design*** Where an underdrain system is included in project drainage design, design should incorporate the parameters below. The actual underdrain layout, outlets, and locations should be developed by a civil engineer. A typical, cross-section detail of an underdrain for this project can be provided upon request.

An underdrain system should be tested by the contractor after installation and after placement and compaction of the overlying backfill to verify that the system functions properly.

- 1) An underdrain system for a building should consist of perforated, rigid, PVC collection pipe at least 4 inches in diameter, non-perforated, rigid, PVC discharge pipe at least 4 inches in diameter, free-draining gravel, and filter fabric, as well as a waterproof membrane.
- 2) The free-draining gravel should contain less than 5 percent passing the No. 200 Sieve and more than 50 percent retained on the No. 4 Sieve, and have a maximum particle size of 2 inches. Each collection pipe should be surrounded on the sides and top (only) with 6 or more inches of free-draining gravel.
- 3) The gravel surrounding the collection pipe(s) should be wrapped with filter fabric (MiraFi 140N® or the equivalent) to reduce the migration of fines into the drain system.
- 4) The waterproof membrane should underlie the gravel and pipe, and be attached to the foundation stem wall as shown in the detail.
- 5) The underdrain system should be designed to discharge at least 5 gallons per minute of collected water.
- 6) The high point(s) for the collection pipe flow lines should be below the grade beam or shallow foundation bearing elevation as shown on the detail. Multiple high points can be beneficial to reducing the depths to which the system would be installed.

The collection and discharge pipe for the underdrain system should be laid on a slope sufficient for effective drainage, but a minimum of 1 percent.

Pipe gradients also should be designed to accommodate at least ½ inch of differential movement after installation along a 40-foot run.

Gradients flatter than 1 percent may be used but will convey water less efficiently and entail an increased risk of local post-construction movements. Steeper gradients, e.g., 1½ percent, will make the system more tolerant of local, differential settlements, possibly resulting in less frequent repairs.

- 7) Underdrain 'clean-outs' should be provided at intervals of no more than 100 feet to facilitate maintenance of the underdrains. Clean-outs also should be provided at collection and discharge pipe elbows of 60 degrees or more.
- 8) The underdrain discharge pipes should be connected to one or more sumps from which water can be removed by pumping, or to outlet(s) for gravity discharge. We suggest that collected waters be discharged directly into the storm sewer system, if possible.

## **PAVEMENT SECTIONS**

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings.

Standard practice in pavement design describes a typical flexible pavement section as a "20-year" design pavement. However, most pavements will not remain in satisfactory condition without routine maintenance and rehabilitation procedures performed throughout the life of the pavement.

***Subgrade Materials*** Based on the results of our field and laboratory studies, the subgrade materials at the subject site consisted largely of silty sands, commonly with gravel. These materials were classified largely as A-2-4 soils in accordance with the AASHTO classification system, with Group Index values of 0.

Resilient Modulus ( $M_R$ ) testing (AASHTO T-307) was performed on a representative composite sample of the subgrade materials encountered at the site. For the sandy materials typical of the proposed grades, a resilient modulus of 6,519 psi was obtained at the optimum moisture content for use in development of the pavement sections.

It is important to note that significant decreases in soil support as quantified by the resilient modulus have been observed as the moisture content increases above the optimum. Therefore, pavements that are not properly drained may experience a loss of the soil support and subsequent reduction in pavement life.

**Anticipated Traffic** Project-specific traffic loads were not available at the time of preparation of this report. Therefore, an equivalent 18-kip daily load application (EDLA) value of 3 was assumed for the parking lot. The EDLA value of 3 was converted to an equivalent 18-kip single-axle load (ESAL) values of 21,900 for a 20-year design life.

If the design traffic loading differs significantly from the assumed value, GROUND should be notified to re-evaluate the pavement sections below.

**Pavement Sections** The soil resilient modulus and the anticipated ESAL values were used to determine the required structural number for the project pavements. The required structural number was then used to develop minimum, pavement sections for the project. Pavement sections were based on the DARWin™ computer program that solves the 1993 AASHTO pavement design equation. Pavement parameters and calculations are summarized in *Appendix A*. A Reliability Level of 80 percent was utilized develop the pavement sections. A structural coefficients of 0.40 and 0.12 were used for hot bituminous asphalt and aggregate base course, respectively. The resultant minimum pavement sections that should be placed at the site are tabulated below.

MINIMUM PAVEMENT SECTIONS

<b>Location:</b>	Parking Lot
<b>Full Depth Asphalt:</b>	4½ in. Asphalt
<b>Composite Section:</b>	4 in. Asphalt / 4 in. Aggregate Base

***Pavement Materials*** Asphalt pavement should consist of a bituminous plant mix composed of a mixture of aggregate and bituminous material. Asphalt mixture(s) should meet the requirements of a job-mix formula established by a qualified engineer as well as applicable City of Commerce City design requirements.

Aggregate base material should meet the criteria of CDOT Class 6 aggregate base course. Base course should be placed in and compacted in accordance with the criteria in the *Project Earthwork* section of this report.

***Subgrade Preparation*** Although subgrade preparation to a depth of 12 inches is typical in the project area, pavement performance commonly can be improved by a greater depth of moisture-density conditioning of the soils. Also, the contractor should be prepared to prepare the subgrade as outlined herein even where elevated subgrade moisture contents are encountered beneath the existing pavements.

***Remedial Earthwork*** Shortly before paving, the pavement subgrade should be excavated and/or scarified to a depth of **12 inches or more**, moisture-conditioned and properly re-compacted. However, due to the potential for settlements resulting from hydro-consolidation of the shallow soils, improved pavement performance could be achieved by a greater depth of remedial earthwork beneath the pavement section, e.g., to a depth of 3 feet. If performance similar to a slab-on-grade floor is preferred, the pavement should be placed on a similarly deep fill section.

Subgrade preparation should extend the full width of the pavement from back-of-curb to back-of-curb. The subgrade for sidewalks and other project hardscaping also should be prepared in the same manner.

Criteria and standards for fill placement and compaction are provided in the *Project Earthwork* section of this report. The contractor should be prepared either to dry the subgrade materials or moisten them, as needed, prior to compaction.

Where adequate drainage cannot be achieved or maintained, excavation and replacement should be undertaken to a greater depth, in addition to the edge drains discussed below.



**Proof Rolling** Immediately prior to paving, the subgrade should be proof rolled with a heavily loaded, pneumatic tired vehicle. Areas that show excessive deflection during proof rolling should be excavated and replaced and/or stabilized. Areas allowed to pond prior to paving will require significant re-working prior to proof-rolling. **Establishment of a firm paving platform (as indicated by proof rolling) is an additional requirement beyond proper fill placement and compaction.** It is possible for soils to be compacted within the limits indicated in the *Project Earthwork* section of this report and fail proof rolling, particularly in the upper range of specified moisture contents.

***Additional Considerations*** The collection and diversion of surface drainage away from paved areas is extremely important to satisfactory performance of the pavements. The subsurface and surface drainage systems should be carefully designed to ensure removal of the water from paved areas and subgrade soils. Allowing surface waters to pond on pavements will cause premature pavement deterioration. Where topography, site constraints or other factors limit or preclude adequate surface drainage, pavements should be provided with edge drains to reduce loss of subgrade support. The long-term performance of the pavement also can be improved greatly by proper backfilling and compaction behind curbs, gutters, and sidewalks so that ponding is not permitted and water infiltration is reduced.

Landscape irrigation in planters adjacent to pavements and in “island” planters within paved areas should be carefully controlled or differential heave and/or rutting of the nearby pavements will result. Drip irrigation systems should be used for such planters to reduce over-spray and water infiltration beyond the planters. Enclosing the soil in the planters with plastic liners and providing them with positive drainage also will reduce differential moisture increases in the surrounding subgrade soils.

In our experience, infiltration from planters adjacent to pavements is a principal source of moisture increase beneath those pavements. This wetting of the subgrade soils from infiltrating irrigation commonly leads to loss of subgrade support for the pavement with resultant accelerating distress, loss of pavement life and increased maintenance costs. This is particularly the case in the later stages of project construction after landscaping has been emplaced but heavy construction traffic has not ended. Heavy vehicle traffic over wetted subgrade commonly results in rutting and pushing of flexible pavements,

and cracking of rigid pavements. Where the subgrade soils are expansive, wetting also typically results in increased pavement heave. In relatively flat areas where design drainage gradients necessarily are small, subgrade settlement or heave can obstruct proper drainage and yield increased infiltration, exaggerated distress, etc. (These considerations apply to project flatwork, as well.)

Also, GROUND's experience indicates that longitudinal cracking is common in asphalt-pavements generally parallel to the interface between the asphalt and concrete structures such as curbs, gutters or drain pans. This of this type is likely to occur even where the subgrade has been prepared properly and the asphalt has been compacted properly.

The anticipated traffic loadings do not include excess loading conditions imposed by heavy construction vehicles. Consequently, heavily loaded concrete, lumber, and building material trucks can have a detrimental effect on the pavement. An effective program of regular maintenance should be developed and implemented to seal cracks, repair distressed areas, and perform thin overlays throughout the life of the pavements.

Most pavements will not remain in satisfactory condition without regular maintenance and rehabilitation procedures performed throughout the life of the pavement. Maintenance and rehabilitation measures preserve, rather than improve, the structural capacity of the pavement structure. Therefore, an effective program of regular maintenance should be developed and implemented to seal cracks, repair distressed areas, and perform thin overlays throughout the lives of the pavements. The greatest benefit of pavement overlaying will be achieved by overlaying sound pavements that exhibit little or no distress.

Crack sealing should be performed at least annually and a fog seal/chip seal program should be performed on the pavements every 3 to 4 years. After approximately 8 to 10 years after construction, patching, additional crack sealing, and asphalt overlay may be required. Prior to overlays, it is important that all cracks be sealed with a flexible, rubberized crack sealant in order to reduce the potential for propagation of the crack through the overlay. If actual traffic loadings exceed the values used for development of the pavement sections, however, pavement maintenance measures will be needed on an accelerated schedule.

## EXTERIOR FLATWORK

We anticipate that the exteriors of proposed buildings and other portions of the site will be provided with concrete flatwork. Like other site improvements, flatwork will experience post-construction settlements as soil moisture contents increase after construction and distress likely will result. The following measures will help to reduce damages to these improvements:

- 1) The soils beneath project sidewalks, paved entryways and patios, masonry planters and short, decorative walls, and other flatwork should be excavated and/or scarified to a depth of **12 inches or more**, moisture-conditioned and properly re-compacted. should be excavated and/or scarified to a depth of 12 inches or more, moisture-conditioned and properly re-compacted. However, due to the potential for settlements resulting from hydro-consolidation of the shallow soils, improved pavement performance could be achieved by a greater depth of remedial earthwork beneath the pavement section, e.g., to a depth of 3 feet. If performance similar to a slab-on-grade floor is preferred, the pavement should be placed on a similarly deep fill section.
- 2) Prior to placement of flatwork, a proof roll should be performed to identify areas that exhibit instability and deflection. The deleterious soils in these areas should be removed and replaced with properly compacted fill. The contractor should take care to achieve and maintain compaction behind curbs to reduce differential sidewalk settlements. As in the case of pavements, passing a proof roll is an additional requirement to placing and compacting the subgrade fill soils within the specified ranges of moisture content and relative compaction in the *Project Earthwork* section of this report. Subgrade stabilization may be cost-effective in this regard.
- 3) Flatwork should be provided with control joints extending to an effective depth and spaced no more than 10 feet apart, both ways. Narrow flatwork, such as sidewalks, likely will require more closely spaced joints.

- 4) In no case should exterior flatwork extend to under any portion of the building where there is less than **2 inches** of vertical clearance between the flatwork and any element of the building. Exterior flatwork in contact with brick, rock facades, or any other element of the building can cause damage to the structure if the flatwork experiences movements.

***Construction and Drainage Between Buildings and Pavements*** Proper design, drainage, construction and maintenance of the areas between individual buildings and parking/driveway areas are critical to the satisfactory performance of the project. Sidewalks, entranceway slabs and roofs, fountains, raised planters and other highly visible improvements commonly are installed within these zones, and distress in or near these improvements is common. Commonly, proper soil preparation in these areas receives little attention during overlot construction because they fall between the building and pavement areas which typically are built with heavy equipment. Subsequent landscaping and hardscape installation often is performed by multiple sub-contractors with light or hand equipment, and necessary over-excavation and soil processing is not performed. Consequently, subgrade soil conditions commonly deviate significantly from specified ranges. Therefore, the contractor should take particular care with regard to proper subgrade preparation in the immediate building exteriors.

***Frost and Ice Considerations*** Nearly all soils other than relatively coarse, clean, granular materials are susceptible to loss of density if allowed to become saturated and exposed to freezing temperatures and repeated freeze – thaw cycling. The formation of ice in the underlying soils can result in heaving of pavements, flatwork and other hardscaping (“ice jacking”) in sustained cold weather of 2 inches or more. This heaving can develop relatively rapidly. A portion of this movement typically is recovered when the soils thaw, but due to loss of soil density some degree of displacement typically will remain. This can result even where the subgrade soils were prepared properly.

Where hardscape movements are a design concern, e.g., at doorways, replacement of the subgrade soils with 3 or more feet of clean, coarse sand or gravel with a drain should be considered, or the element supported on foundations similar to the building and spanning over a void. Detailed parameters and discussion in this regard can be provided upon request. It should be noted that where such open graded granular soils are placed, water can infiltrate and accumulate in the subsurface relatively easily, which can lead to increased settlement or heave from factors unrelated to ice formation. The

relative risks from these soil conditions should be taken into consideration where ice jacking is a concern. GROUND will be available to discuss this upon request.

**Concrete Scaling** Surface scaling of sidewalks and other exterior concrete can result from poor workmanship during construction, such as 'over-finishing' the surface. It also can result from exposure to relatively severe weather conditions with repeated freeze-thaw cycles. In GROUND's experience, if reducing the potential for freeze-thaw scaling is a design consideration, the following measures are beneficial: a) maintaining a maximum water/cement ratio of 0.45 by weight for exterior concrete, b) including Type F fly ash in the mix for exterior concrete as 20 percent of the cementitious material, and c) use of exterior concrete that exhibits a minimum compressive strength of 4,500 psi. Inclusion of 'fibermesh' in the concrete mix also may be beneficial for reducing surficial scaling. (These concrete mix design criteria should be coordinated with other project requirements including the criteria for sulfate resistance presented in the *Water-Soluble Sulfates* section of this report.) In addition, the use of de-icing salts on exterior concrete flatwork during the first winter after construction will increase the likelihood of the development of scaling. Placement of flatwork concrete during cold weather so that it is exposed to freeze-thaw cycling before it is fully cured also increases its vulnerability to scaling. Concrete placing during cold weather conditions should be blanketed or tented to allow full curing. Depending on the weather conditions, this may result in 3 to 4 weeks of curing, and possibly more.

## CLOSURE

**Geotechnical Review** The author of this report or a GROUND principal should be retained to review project plans and specifications to evaluate whether they comply with the intent of the measures discussed in this report. The review should be requested in writing.

The geotechnical conclusions and parameters presented in this report are contingent upon observation and testing of project earthworks by representatives of GROUND. If another geotechnical consultant is selected to provide materials testing, then that consultant must assume all responsibility for the geotechnical aspects of the project by concurring in writing with the parameters in this report, or by providing alternative parameters.

**Materials Testing** DHM Design or the City of Commerce City, should consider retaining a geotechnical engineer to perform materials testing during construction. The performance of such testing or lack thereof, however, in no way alleviates the burden of the contractor or subcontractor from constructing in a manner that conforms to applicable project documents and industry standards. The contractor or pertinent subcontractor is ultimately responsible for managing the quality of his work; furthermore, testing by the geotechnical engineer does not preclude the contractor from obtaining or providing whatever services that he deems necessary to complete the project in accordance with applicable documents.

**Limitations** This report has been prepared for DHM Design, as it pertains to design and construction of the proposed building and related improvements as described herein. It may not contain sufficient information for other parties or other purposes.

In addition, GROUND has assumed that project construction will commence by Spring, 2015. Any changes in project plans or schedule should be brought to the attention of a geotechnical engineer, in order that the geotechnical conclusions in this report may be re-evaluated and, as necessary, modified.

The geotechnical conclusions and criteria in this report relied upon subsurface exploration at a limited number of exploration points, as shown in Figure 1, as well as the means and methods described herein. Subsurface conditions were interpolated between and extrapolated beyond these locations. It is not possible to guarantee the subsurface conditions are as indicated in this report. Actual conditions exposed during construction may differ from those encountered during site exploration.

If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, a geotechnical engineer should be retained at once, so that re-evaluation of the conclusions for this site may be made in a timely manner. In addition, a contractor who relies upon this report for development of his scope of work or cost estimates may find the geotechnical information in this report to be inadequate for his purposes or find the geotechnical conditions described herein to be at

variance with his experience in the greater project area. The contractor is responsible for obtaining the additional geotechnical information that is necessary to develop his workscope and cost estimates with sufficient precision. This includes current depths to groundwater, etc.

*ALL DEVELOPMENT CONTAINS INHERENT RISKS.* It is important that ALL aspects of this report, as well as the estimated performance (and limitations with any such estimations) of proposed improvements are understood by DHM Design and the City of Commerce City. Utilizing these criteria and measures herein for planning, design, and/or construction constitutes understanding and acceptance of the conclusions with regard to risk and other information provided herein, associated improvement performance, as well as the limitations inherent within such estimates.

If any information referred to herein is not well understood, then DHM Design, the Owner, or anyone using this report, should contact the author or a GROUND principal immediately. We will be available to meet to discuss the risks and remedial approaches presented in this report, as well as other potential approaches, upon request.

This report was prepared in accordance with generally accepted soil and foundation engineering practice in the Adams County, Colorado, area at the date of preparation. Current applicable codes may contain criteria regarding performance of structures and/or site improvements which may differ from those provided herein. Our office should be contacted regarding any apparent disparity. GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or conclusions contained herein.

This document, together with the concepts and conclusions presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of or improper reliance on this document without written authorization and adaption by GROUND Engineering Consultants, Inc., shall be without liability to GROUND Engineering Consultants, Inc.

GROUND appreciates the opportunity to complete this portion of the project and welcomes the opportunity to provide DHM Design or the City of Commerce City, with a proposal for construction observation and materials testing.

Sincerely,

**GROUND Engineering Consultants, Inc.**

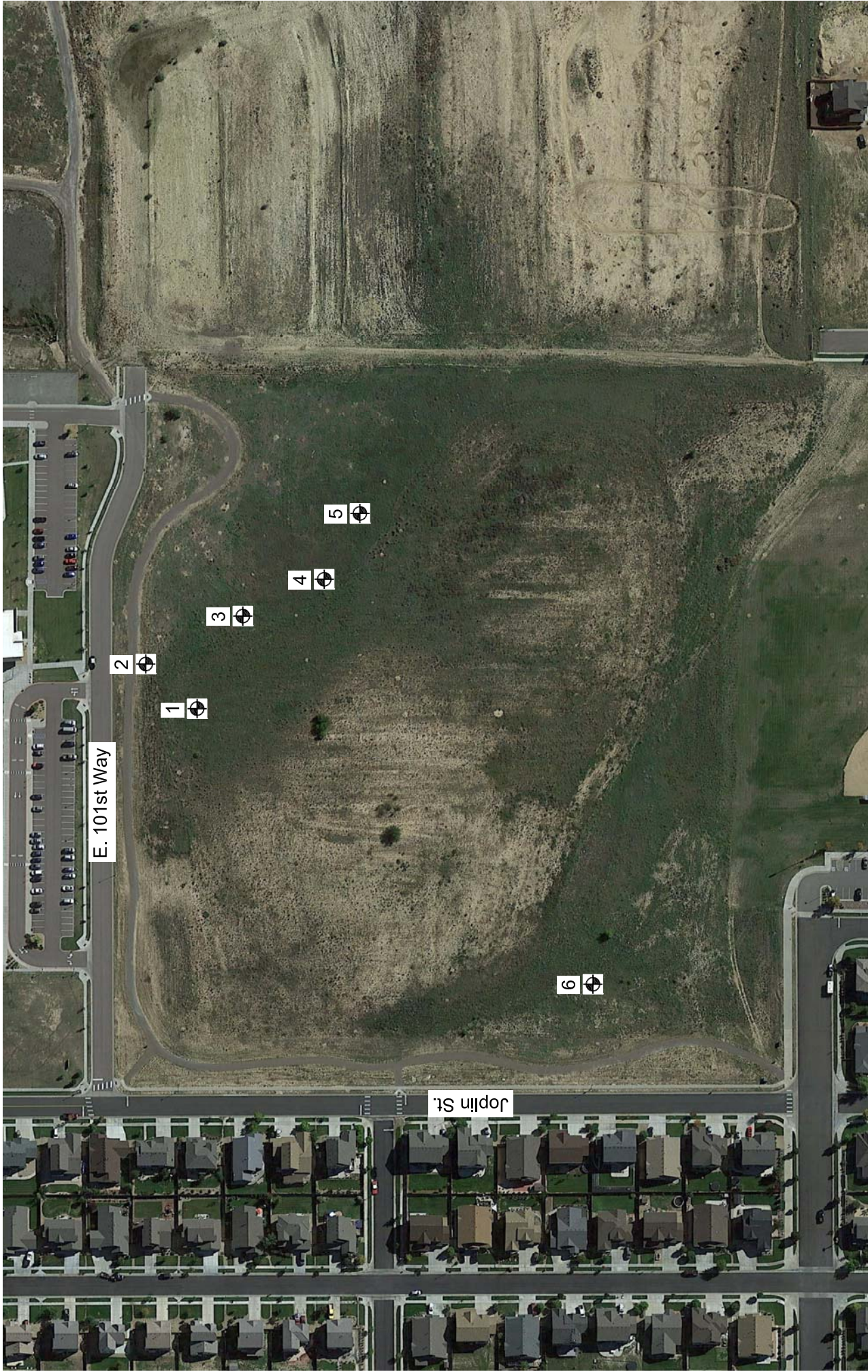


Brian H. Reck, P.G., C.E.G., P.E.

A handwritten signature in blue ink, likely belonging to James B. Kowalsky, P.E.

Reviewed by James B. Kowalsky, P.E.





(Not to Scale)

# GROUND

ENGINEERING CONSULTANTS

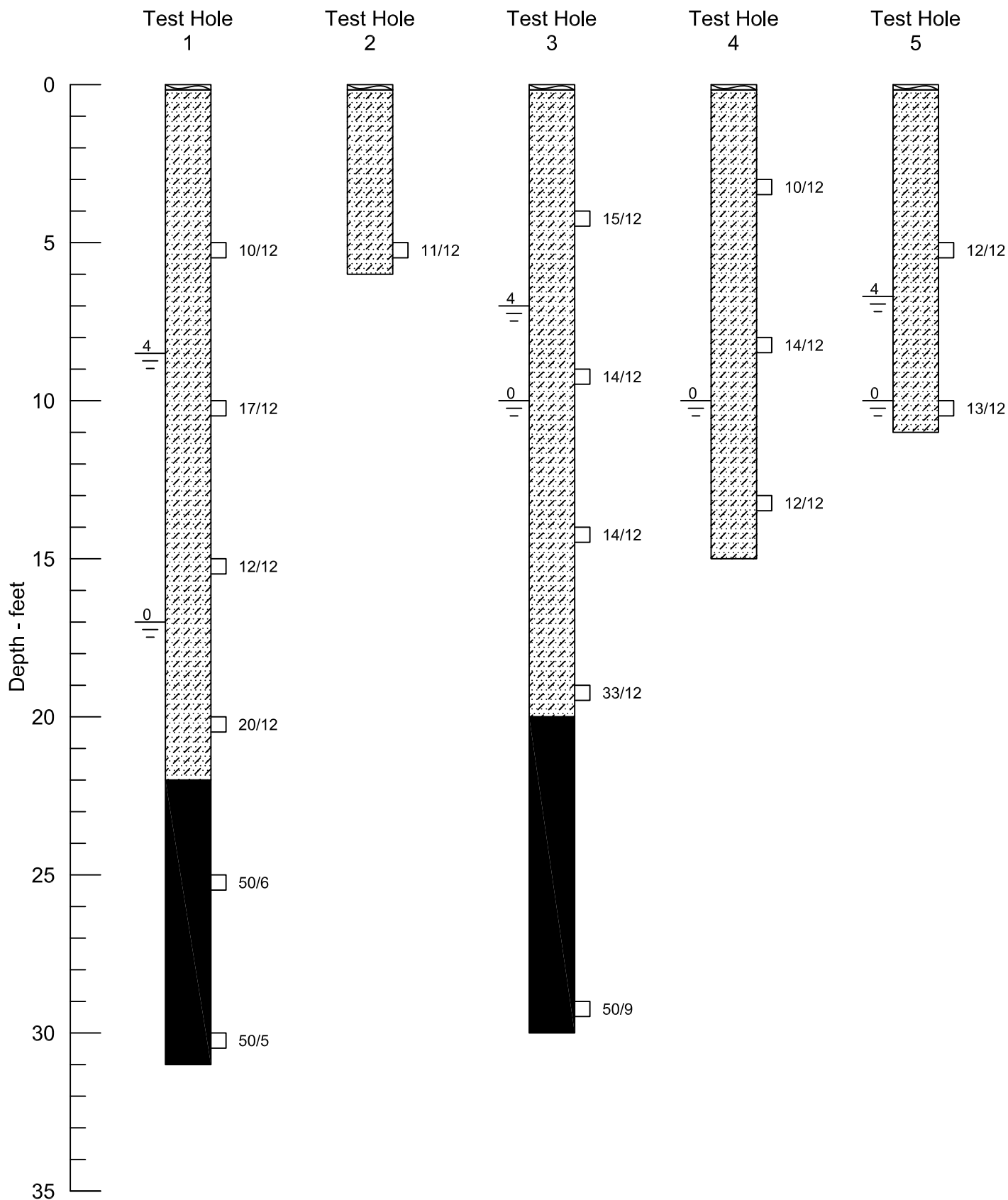
## LOCATION OF TEST HOLES

JOB NO.: 14-3066

FIGURE: 1

CADFILE NAME: 3066SITE.DWG

1  Indicates test hole number and approximate location.



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## LOGS OF TEST HOLES

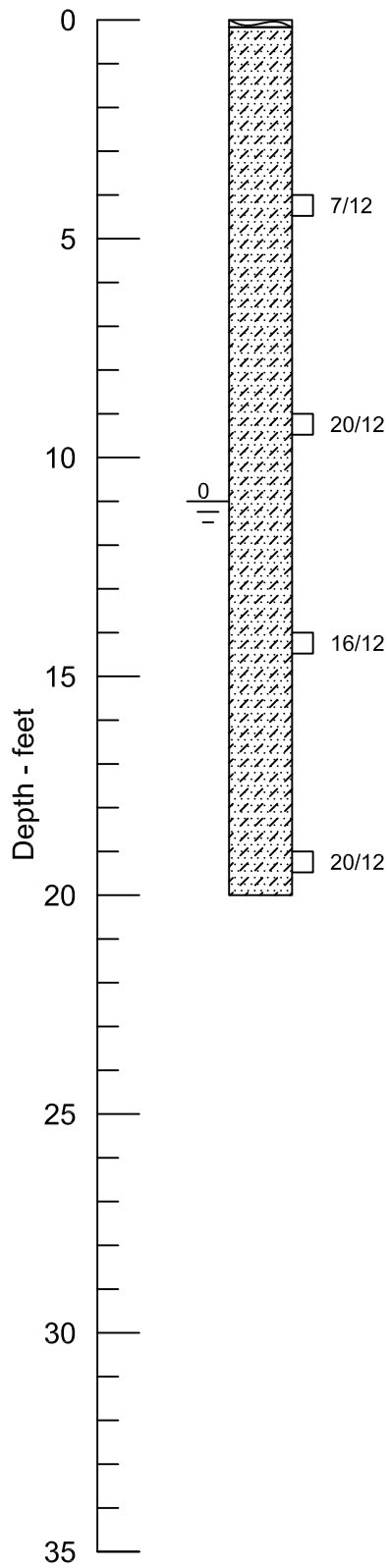
JOB NO.: 14-3066

FIGURE: 2

CADFILE NAME: 3066LOG01.DWG



Test Hole  
6



**GROUND**  
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LOGS OF TEST HOLES

JOB NO.: 14-3066

FIGURE: 3

CADFILE NAME: 3066LOG02.DWG

## LEGEND:



Topsoil



Sands: Ranged from clayey to silty sands. Lenses of sandy clays and clays were noted locally within the sands. They were moist to wet, non-plastic to medium plastic, medium dense, and brown to dark-brown to gray in color.



Claystone Bedrock: Highly plastic with fine grains, moist, medium hard to hard, gray to green gray to brownish yellow color.



Drive sample, 2-inch I.D. California liner sample

23/12 Drive sample blow count, indicates 23 blows of a 140-pound hammer falling 30 inches were required to drive the sampler 12 inches.



Depth to water level and number of days after drilling that measurement was taken.

## NOTES:

- 1) Test holes were drilled on 08/08/2014 with 4-inch diameter continuous flight augers.
- 2) Locations of the test holes were measured approximately by pacing from features shown on the site plan provided.
- 3) Elevations of the test holes were not measured and the logs of the test holes are drawn to depth.
- 4) The test hole locations and elevations should be considered accurate only to the degree implied by the method used.
- 5) The lines between materials shown on the test hole logs represent the approximate boundaries between material types and the transitions may be gradual.
- 6) Groundwater level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.
- 7) The material descriptions on this legend are for general classification purposes only. See the full text of this report for descriptions of the site materials and related recommendations.

**GROUND**  
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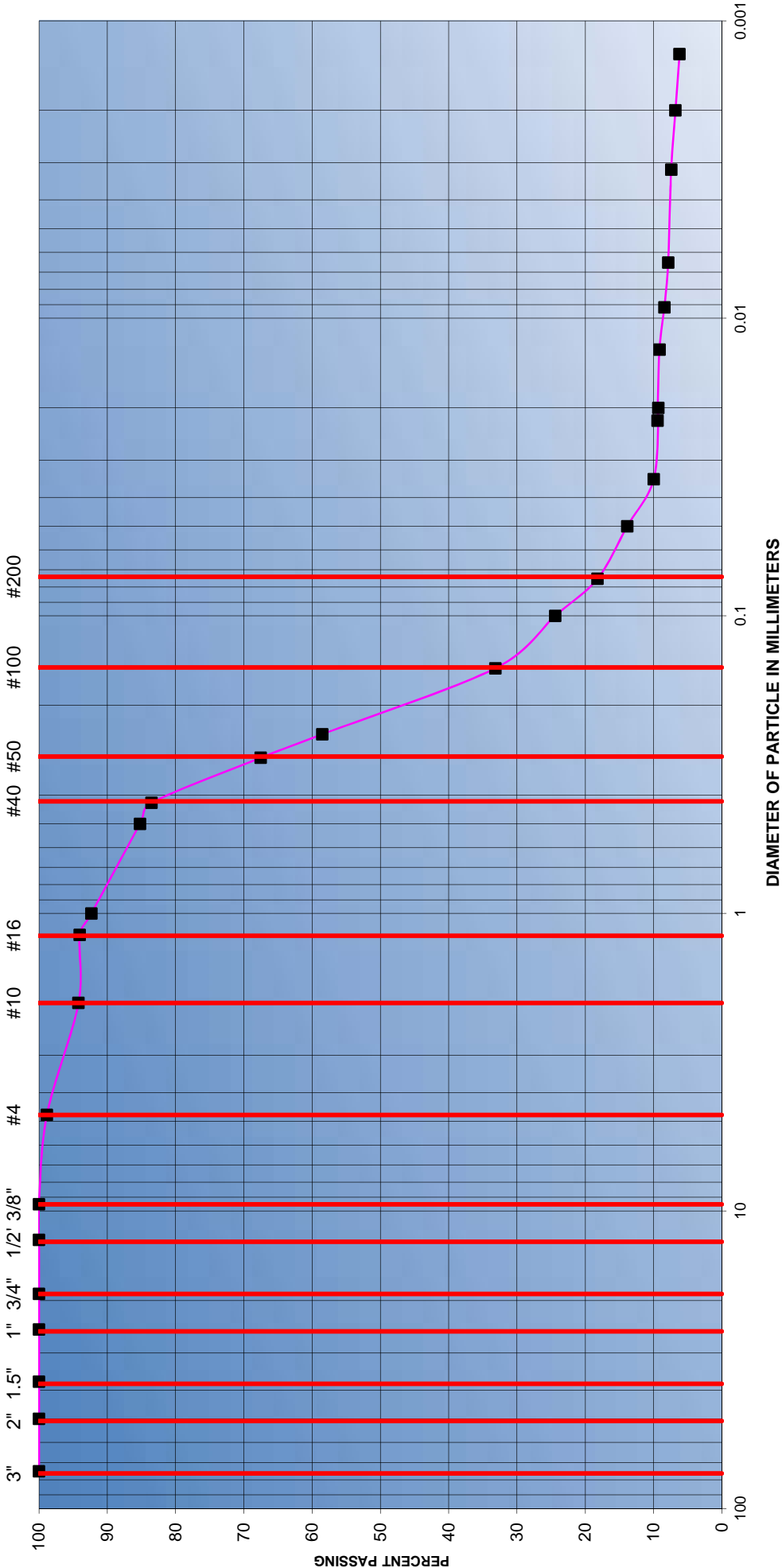
## LEGEND AND NOTES

JOB NO.: 14-3066

FIGURE: 4

CADFILE NAME: 3066LEG.DWG

SIEVE ANALYSIS: ASTM C 136 with C 117 or D 1140	HYDROMETER ANALYSIS: ASTM D 422
Sieve Openings: U.S. Standard Sieves	Timed Readings



COBBLE	GRAVEL	SAND	SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine

Sample of: Silty SAND	Gravel	1%	Sand	81%	Silt and Clay	18%
From: Test Hole 1 at 5 feet	<b>GROUND</b> ENGINEERING CONSULTANTS					
	GRADATION TEST RESULTS					
	JOB NO.: 14-3066					
FIGURE: 5						



TABLE 1  
SUMMARY OF LABORATORY TEST RESULTS

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation		Passing No. 200 Sieve (%)	Atterberg Limits		Swell - Consolidation * (%) (Surcharge (psf))	USCS Classification	AASHTO Classification (GI)	Soil or Bedrock Type
Test Hole No.	Depth (feet)			Gravel (%)	Sand (%)		Liquid Limit	Plasticity Index				
1	5	7.1	106.5	1	81	18		N P		SM	A-2-4	Silty SAND
1	15	21.7	103.8			47	28	11		SC		Clayey SAND
3	4	7.5	103.3			15		N P	-1.0 ( 500 psf)	SM	A-2-4	Silty SAND
4	3	14.3	100.5			37		N P	-1.0 (1,500 psf)	SM	A-4	Silty SAND
5	10	30.6	88.7			78	32	12		CL		CLAY with Sand
6	9	17.7	108.1			59	27	10		CL		Sandy CLAY
Composite						20		N P	M <sub>R</sub> = 6,519 psi	SM	A-2-4 (0)	Silty SAND

N P indicates 'non-plastic.'

\* Negative values indicate consolidation.

Job No. 14-3066



TABLE 2  
SUMMARY OF SOIL CORROSION TEST RESULTS

Sample Location		Water Soluble Sulfates (%)	pH	Redox Potential (mV)	Sulfide Reactivity	Resistivity (ohm-cm)	Soil or Bedrock Type
Test Hole No.	Depth (feet)						
1	15	0.02	8.1	-79	Trace	1,282	Clayey SAND
4	3	0.01					Silty SAND

## APPENDIX A

### **Pavement Section Calculations**



# 1993 AASHTO Pavement Design

## DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare  
Computer Software Product  
Network Administrator

### Flexible Structural Design Module

Job No. 14-3066  
Parking Lot  
Asphalt Section

#### Flexible Structural Design

18-kip ESALs Over Initial Performance Period	21,900
Initial Serviceability	4.5
Terminal Serviceability	2
Reliability Level	80 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	6,519 psi
Stage Construction	1
Calculated Design Structural Number	1.77 in

#### Specified Layer Design

<u>Layer</u>	<u>Material Description</u>	Struct Coef. <u>(Ai)</u>	Drain Coef. <u>(Mi)</u>	Thickness <u>(Di)(in)</u>	Width <u>(ft)</u>	Calculated <u>SN (in)</u>
1	Asphalt	0.4	1	4.5	-	1.80
Total	-	-	-	4.50	-	1.80

1993 AASHTO Pavement Design

# DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare  
Computer Software Product  
Network Administrator

## Flexible Structural Design Module

Job No. 14-3066  
Parking Lot  
Composite Section

### Flexible Structural Design

18-kip ESALs Over Initial Performance Period	21,900
Initial Serviceability	4.5
Terminal Serviceability	2
Reliability Level	80 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	6,519 psi
Stage Construction	1
Calculated Design Structural Number	1.77 in

### Specified Layer Design

<u>Layer</u>	<u>Material Description</u>	Struct Coef. <u>(Ai)</u>	Drain Coef. <u>(Mi)</u>	Thickness <u>(Di)(in)</u>	Width <u>(ft)</u>	Calculated <u>SN (in)</u>
1	Asphalt	0.4	1	4	-	1.60
2	Aggregate Base	0.12	1	4	-	0.48
Total	-	-	-	8.00	-	2.08

