



## City of Northglenn Parks and Recreation

11701 Community Center Drive  
Northglenn, CO 80233

### KIWANIS OUTDOOR SPLASH PAD ADDITION

**July 2018**

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**BID FORM**Title: Kiwanis Outdoor Splash Pad Addition

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.	DESCRIPTION OF BID ITEM	QUANTITY	PAY UNIT	UNIT PRICE	TOTAL COST OF BID ITEM
1	Mobilization & General Conditions	1	LS	Lump Sum	
2	Erosion Control	1	LS	Lump Sum	
3	Construction Surveying and Staking	1	LS	Lump Sum	
4	Traffic Control	1	LS	Lump Sum	
5	Tree Protection	1	LS	Lump Sum	
6	Clearing and Grubbing	1	LS	Lump Sum	
7	Site Demolition	1	LS	Lump Sum	
8	Site Grading & Earthwork	1	LS	Lump Sum	
9	Strip & Stockpile Topsoil	1	LS	Lump Sum	
10	Place Topsoil	1	LS	Lump Sum	
11	Site Utility Improvements	1	LS	Lump Sum	
12	Concrete Paving (Walks & Plaza Areas)	9,150	SF		
13	Concrete Edger – 6"x6"	45	LF		
14	Planter Wall	1	LS	Lump Sum	
15	Chainlink Fencing and Mow Band	1	LS	Lump Sum	
16	Restroom/Pool House Building Site Preparation/Coordination	1	LS	Lump Sum	
17	Splash-pad Equipment Installation	1	LS	Lump Sum	
18	Kiddie Pool Equipment Re-Installation	1	LS	Lump Sum	
19	Trash Receptacles	2	EA		

20	Picnic Table	3	EA		
21	Electrical Improvements	1	LS	Lump Sum	
22	Site Landscaping	1	LS	Lump Sum	
23	Bluegrass Sod	17,000	SF		
24	Complete Irrigation System	1	LS	Lump Sum	
25	Privacy Screening	1	LS	Lump Sum	
	<b>TOTAL BASE BID PRICE IN FIGURES</b> (Bid Items 1 thru 25)				

**TOTAL BASE BID (Bid items 1-25) IN WORDS:**

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**DOLLARS AND CENTS.**

# SUPPLEMENTAL BID SCHEDULE – UNIT PRICES

ITEM	Unit	Unit Price
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**Unit prices are for both ADD and DEDUCTS.**

Tree Protection	LF	_____
Sod including amendments & fine grading	SF	_____
Concrete Paving - 6" depth	SF	_____
Earthwork Import/Export	CY	_____
Topsoil Striping and Replacement	CY	_____
Deciduous Shade Tree	EA	_____
Evergreen Tree	EA	_____
Ornamental Tree	EA	_____
Deciduous Shrub	EA	_____
Evergreen Shrub	EA	_____
Ornamental Grass	EA	_____
Landscape Mulch	SF	_____

- 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: \_\_\_\_\_

**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, but is not limited to, the following: demolition, site grading, underground utilities, concrete paving, cast-in-place concrete, relocating existing kiddie pool equipment, splash-pad installation, prefabricated restroom/pool-house building coordination, fencing, screening, planting, irrigation, 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 un-dimensioned 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 as part of their bid.
- 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. Construction Facilities and Temporary Controls – Section 01500
  - B. Excavating, Backfilling & Compacting for Utility Systems – Section 02200
  - C. Concrete Walks, Curbs and Miscellaneous Flatwork – 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. Refer to General Conditions.

1.7 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. Administration, Procedures and Codes - Section 01105
- 1.4 GENERAL REQUIREMENTS:
- A. Contractor 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

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

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

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

Work: The work of this bid item includes, but is not limited to, all general conditions, mobilization costs, staging area, restoration and seeding of disturbed areas, construction fencing, temporary facilities, testing, pot-holing, vehicle tracking, dust control, permits, taxes, and fees.

**Bid Item #2 – Erosion Control**

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

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

Work: The work of this bid item includes, but is not limited to, application for and obtaining a CDPS Construction Activity Permit from the Colorado Department of Health and Environment (CDPHE), and implementation of the Erosion Control 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 Erosion Control Drawings. Excluded from this item is Seeding.

**Bid Item #3 – Construction Surveying and Staking**

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

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

Work: The work of this bid item includes, but is not limited to, all construction surveying required to complete project as shown on plans.

#### **Bid Item #4 – Traffic Control**

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

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

Work: The work in this bid item includes, but is not limited to, all temporary facilities, traffic control, permits, taxes, and fees.

#### **Bid Item #5 – Tree Protection**

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

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

Work: The work of this bid item includes, but is not limited to, all material, labor and equipment required to establish tree protection, and remove the tree protection at the end of the project.

The lump sum price should also include the maintenance of the tree protection throughout the duration of the project as well as the labor, materials and equipment required to restore the site to its original condition.

#### **Bid Item #6 – Clearing and Grubbing**

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

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

Work: The work in this bid item includes all clearing and grubbing, tree removals, and disposal of waste materials.

#### **Bid Item #7 – Site Demolition**

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

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

Work: The work in this bid item includes, but is not limited to, saw-cutting, demolition and removal of concrete paving, fence, site furniture, light poles, disposal of waste materials and removal of kiddie pool pump equipment for relocation of the existing kiddie pool pump equipment.

#### **Bid Item #8 – Site Grading & Earthwork**

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

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

Work: The work of this section consists of, but is not limited to, general excavation, general embankment, importing, exporting, backfill materials, compaction, finish grading and incidental work.

#### **Bid Item #9 – Strip and Stockpile Topsoil**

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

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

Work: The work of this section consists of topsoil stripping and topsoil stockpiling.

#### **Bid Item #10 – Place Topsoil**

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

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

Work: The work of this section consists of placing topsoil.

### **Bid Item #11 – Site Utility Improvements**

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

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

Work: The work in this bid item includes, but is not limited to, all materials, labor and equipment necessary to construct stormwater, sanitary and water utility improvements, including all utility connections to (2) prefabricated restroom/pool-house buildings, excavation, trenching, bedding, furnishing, joining and cutting (where necessary), backfill material, joint fasteners, Type K copper pipe, PVC pipe, cleanouts, gas service, taps, and repair of existing conditions disturbed by installation of improvements.

### **Bid Item #12 – Concrete Paving (Walks, Plaza & Splash-Pad Areas)**

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.

Work: The work in this bid item includes, but is not limited to, all materials, labor and equipment necessary to install 6" depth grey concrete paving, 6" depth colored concrete banding, 6" depth concrete in splash-pad area, grading, sub-grade preparation, base course material and placement, formwork, fibermesh reinforcement, finishing, sawcutting or hand-tooling (per plans), backfill along paving, disposal of excess excavated material for a complete installation.

### **Bid Item #13 – Concrete Edger – 6"x6"**

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 lineal foot.

Work: The work in this bid item includes, but is not limited to, all materials, labor and equipment necessary to install concrete edge, steel reinforcement, grading, sub grade preparation, formwork, fibermesh reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

### **Bid Item #14 – Planter Wall**

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

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

Work: The work in this bid item includes, but is not limited to, all materials, labor and equipment necessary to install the planter wall per details shown in plans, concrete, steel reinforcement, grading, sub-grade preparation, formwork, fiber-reinforcement, finishing, backfill along edges, grouting and disposal of excess excavated material for a complete installation.

### **Bid Item #15 – Chainlink Fencing and Mow Band**

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

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

Work: The work in this bid item includes, but is not limited to, all materials, labor and equipment necessary to install 4'-0" ht. & 6'-0" ht. chainlink fence, gates, concrete mow-band, steel reinforcement, grading, sub grade preparation, formwork, fibermesh reinforcement, finishing, backfill along edges, disposal of excess excavated material for a complete installation.

**Bid Item #16 – Restroom/Pool-House Building Site Preparation/Coordination**

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

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

Work: The work in this bid item includes, but is not limited to, scheduling, site preparation for placement of (2) prefabricated buildings, excavation of soils, compacted base material, and all materials, labor and equipment necessary to complete the work. Actual building placement will be performed by the building manufacturer. Building and shipping costs shall be paid for by City of Northglenn (NIC). Utility connections to restroom/concessions included in Site Utility Improvements bid item.

**Bid Item #17 – Splash-Pad Equipment Installation**

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

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

Work: The work in this bid item includes, but is not limited to, scheduling, site preparation, installation of all splash-pad equipment (per manufacturers recommendation), pump equipment installation, pool chemical tanks, connections from splash-pad to pump equipment within pool-house, utility connections, detailed shop drawings from a qualified pool/splash-pad installer, and all materials, labor and equipment necessary to complete a fully functioning splash-pad feature. Splash-pad equipment and shipping costs shall be paid for by City of Northglenn (NIC).

**Bid Item #18 – Kiddie Pool Equipment Re-installation**

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

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

Work: The work in this bid item includes, but is not limited to, scheduling, coordination prior to existing pool-house demolition (NIC) for removal of kiddie pool pump equipment, re-installation of existing kiddie pool pump equipment into new pool-house building, connections from existing kiddie pool to new pump location, utility connections, tank connections, and all materials, labor and equipment necessary to complete a fully functioning splash-pad feature. Splash-pad equipment and shipping costs shall be paid for by City of Northglenn (NIC).

**Bid Item #19 – Trash Receptacles**

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

Payment: Payment for all work included will be at the contract unit price, per each item.

Work: The work in this bid item includes, but is not limited to, trash receptacles, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #20 – Picnic Tables**

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

Payment: Payment for all work included will be at the contract unit price, per each item.

Work: The work in this bid item includes, but is not limited to, picnic tables, chairs, mounting hardware, and all materials, labor and equipment necessary to complete the work.

**Bid Item #21 – Electrical Improvements**

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

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

Work: The work in this bid item includes, but is not limited to, coordination with Xcel, connections to (2) prefabricated buildings, complete electrical distribution system, Xcel disconnect, conduit, wiring, meter, electrical panels, fixtures, connections to Splash-pad equipment, kiddie pool equipment, and all other related materials, labor and equipment necessary to complete the work as shown on plans.

**Bid Item #22 – Site Landscaping**

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

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

Work: The work in this bid item includes, but is not limited to, soil prep, landscape mulch, all trees, deciduous shrubs, evergreen shrubs, ornamental grasses, tree stakes/wire, as shown on plans and all equipment, materials and labor to complete the work.

**Bid Item #23 – Bluegrass Sod**

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.

Work: The work in this bid item includes, but is not limited to, soil preparation, amendments, fine grading, sod, rolling, fertilizing and all equipment, materials and labor to complete the work.

**Bid Item #24 – Complete Irrigation System**

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

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

Work: The work in this bid item includes, but is not limited to, removal of existing heads in disturbed areas of construction, connections to existing irrigation system, all tap connections, meter vault, street cutting, excavation, patching, booster pump, backflow, guard cage, controller, laterals, mainline, valve boxes, wiring, spray heads, rotors, trenching, sleeving, excavation and all equipment, materials and labor to complete the work to complete and maintain a fully functional irrigation system, as shown on plans.

**Bid Item #25 – Privacy Screen**

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

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

Work: The work in this bid item includes, but is not limited to, fabrication of steel privacy screens, posts, perforated steel panels, attachments, anchoring to concrete, coordination with underground utilities, welding and labor to complete the work, as shown on plans.

END OF SECTION



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

- A. Drawings and general provisions of the Contract apply to this Section.

**1.2 SUMMARY**

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

**1.3 DEFINITIONS**

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

**1.4 SUBMITTAL PROCEDURES**

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
- B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
- C. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals.

- D. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- E. Submit a minimum of four paper copies of each submittal unless otherwise indicated. Two copies will be returned to the contractor.
  - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer.
  - 2. Submit five copies of operation and maintenance manuals.
- F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return submittals, without review, received from sources other than Contractor.
  - 1. Transmittal Form: Complete the sample form at end of Section and include with submittals. City will provide electronic version upon request. Include the following information:
    - a. Project name.
    - b. Date.
    - c. Name of Contractor.
    - d. Name of subcontractor.
    - e. Name of supplier.
    - f. Name of manufacturer.
    - g. Submittal number.
    - h. Number and title of appropriate Specification Section.
    - i. Drawing number and detail references.
    - j. Location(s) where product is to be installed.
    - k. Other necessary identification.
  - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked "A - NO EXCEPTIONS TAKEN or B - FURNISH AS CORRECTED".
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as

necessary for performance of construction activities. Show distribution on transmittal forms.

1. Use for Construction: Use only final submittals with mark indicating "A - NO EXCEPTIONS TAKEN or B - FURNISH AS CORRECTED" taken by Owner's Representative.
- I. Required Submittals: (This is not an all-inclusive list. Engineer reserves the right to request additional submittals as required.)
1. Project Schedule
  2. Subcontractor list if applicable
  3. All other requested submittals in separate sections.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Submit electronic submittals directly to extranet specifically established for Project.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Manufacturer's catalog cuts.
    - e. Compliance with specified referenced standards.
    - f. Testing by recognized testing agency.
    - g. Application of testing agency labels and seals.
    - h. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Engineer's CAD Drawings is otherwise permitted.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and

installed.

- E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Owner's Representatives and owners, and other information specified.
- C. Welding Certificates: Prepare and provide documentation that welding procedures and personnel comply with AWS requirements. Include names of firms and personnel certified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- E. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- F. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- G. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - 1. Owner's Representative will not review submittals that include MSDSs and will return the entire submittal for resubmittal.
- H. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Owner's Representative.
  - 1. Owner's Representative will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

## 2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### PART 3 - EXECUTION

#### 3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### 3.2 OWNER'S REPRESENTATIVE'S AND CONSTRUCTION MANAGER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
  - 1. A - NO EXCEPTIONS TAKEN
  - 2. B - FURNISH AS CORRECTED
  - 3. C - REJECTED – SEE REMARKS
  - 4. D - REVISE AND RESUBMIT
- C. Informational Submittals: Engineer will review each submittal and will not return it, or

will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

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. Contractor's Responsibilities:

1. The Contractor 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 shall be included in the Contract Sum.
2. The Contractor 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 Contractor 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 Contractor:

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 substitute.

### 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. Refer to City of Northglenn Public Right-of-way Standards and Specifications.

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 substitution," 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, Contractor shall 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. Refer to General Conditions.
  - 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, Contractor to employ skilled drafters to transfer changes, location information and other data to a set of reproducible mylar drawings furnished by Owner's Representative. Review data and transfer and supplement with additional drawings as suited to conditions per direction of the Owner's Representative.

1.4 SUBMITTAL:

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01720

**PART 1 - GENERAL**

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

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

#### 1.6 SUBMITTALS:

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01740

**PART 1: GENERAL**

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

## PART 2: PRODUCTS

### 2.1 BACKFILL MATERIALS:

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

## PART 3: EXECUTION

### 3.1 PREPARATION:

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

### 3.2 DEMOLITION:

- A. 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.
- B. Items to be Salvaged: Mechanical equipment for the controls and operation of the existing kiddie pool. Refer to plans for additional items to be salvaged.

### 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. Erosion Sediment Control – Section 01565
  - B. Removal of Buildings - Section 02050.
  - C. Excavating, Backfilling & Compacting for Utility Systems– Section 02220.
  - D. 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 Contractor 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 6" +/- 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 (6" depth for all disturbed areas). Stockpile topsoil in locations indicated on the Drawings or as directed by the Construction Manager.

### 3.6 EXCAVATION:

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

### 3.7 DEWATERING:

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

### 3.8 SPECIAL CONDITIONS:

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

### 3.9 FILL AND BACKFILL:

- A. General: Place soil material in layers to required subgrade elevations, for each area

classification listed below, using materials specified in this Section.

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

### 3.10 PLACEMENT AND COMPACTION:

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

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



- L. Density Tests: Field density tests shall be made by the City testing laboratory at locations and depths selected by the Construction Manager. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate that the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.
  - 1. Acceptance Criteria under pavements and structures: Intervals and quantities of tests required shall be established by the Soils Engineer and approved by the Construction Manager. On-site or imported clay materials shall be compacted to at least 95 percent of maximum standard Proctor dry density (ASTM D 698) at moisture content within 2 percent of optimum. Granular material, whether imported or developed on-site, shall be moisture conditioned to within 2 percent of optimum and compacted to at least 95 percent of maximum modified Proctor dry density (ASTM D 1557).
  - 2. Under landscape areas: 85 percent of maximum standard Proctor dry density at moisture content within 2 percent of optimum (ASTM D 698).

### 3.11 GRADING:

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

### 3.12 PLACING STOCKPILED TOPSOIL:

- A. Refer to Section 02925.

### 3.13 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are

disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

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

#### 3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS:

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

END OF SECTION 02200

## **SECTION 02220 EXCAVATING, BACKFILLING & COMPACTING FOR UTILITY SYSTEMS**

### **PART 1 GENERAL**

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

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

#### 1.6 LAYOUT AND SURVEY:

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

#### 1.7 SITE MAINTENANCE:

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

### PART 2 PRODUCTS

#### 2.1 FILLS:

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

## 2.2 SHORING AND BRACING:

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

## PART 3 EXECUTION

### 3.1 EXCAVATION:

#### A. General:

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

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

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

### 3.2 EXCESS EXCAVATED MATERIAL:

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

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

### 3.3 PLACEMENT OF FILLS:

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

### 3.4 EXISTING UTILITIES:

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

### 3.5 COMPACTION:

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

### 3.6 TESTING:

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

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

3.7 STREET AND TRAIL REPAIR:

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

3.8 CLEAN UP:

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

END OF SECTION 02220



**PART 1: GENERAL**

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division – 1 Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of 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. Concrete Walks, Curbs, Miscellaneous Flatwork – Section 02520
  - C. Cast in Place Concrete – Section 03300

**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. Sodding – Section 02935.
  - C. 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 02220  
Watering- Section 02233  
Erosion Sediment Control - Section 1565  
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>U.S. Standard Sieve Size</u>	<u>Percent by Weight Passing Square Mesh Sieves</u>	
	Type I	Type II
3-inch	-	100
12-inch	-	-
:inch	-	20-90
d-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.

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)				
	Fine Grained Soils			Coarse Grained Soils*	
	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

## **SECTION 02520                    CONCRETE WALKS, CURBS AND MISCELLANEOUS FLATWORK**

### **PART 1: GENERAL**

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings, and other Division Specification sections apply to Work of this section.
- 1.2 DESCRIPTION: The work of this section consists of constructing concrete walks, concrete edging, 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 Contractor.
  - 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: 4,500 PSI minimum at twenty-eight days.
- H. Manufacture and Delivery: Measurement of materials, batching, mixing,

transporting, and delivery shall be as specified in ASTM C94-90. Discharge concrete into forms within 1-1/2 hours after introduction of water to cement. When temperature of concrete is 85 degrees F or above, the time between introduction of water to cement and complete discharge of concrete into forms shall not exceed 45 minutes.

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

### PART 3: EXECUTION

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

depositing concrete, screed and darby or bullfloat.

3.5 CONCRETE FINISHING:

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

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

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

- A. Expansion Joints: Expansion joint material shall be provided at the following locations and shall be in place prior to the placing of concrete: 1) at each end of curb return; 2) between sidewalk and driveway slabs or service walks; 3) between new concrete and existing concrete; 4) as shown on the plans; 5) between new concrete and fixed vertical objects, or 6) as directed by the Construction Manager.
- B. Contraction (Control) Joints in Walks:
- C. Contraction joints in plazas shall be formed by hand tooling to a depth of one-third the slab thickness or as indicated on the plans. Tooled joints shall be placed in patterns and locations indicated on plans. Contraction joints on linear sidewalks and trails, and concrete edging shall be formed with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 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-third the slab thickness or as indicated on the plans.
- D. Joints in Handicap Ramps: Joints in handicap ramps shall be heavily tooled in accordance with standard City details.
- E. 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.

- 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

**SECTION 02815**  
**IRRIGATION SYSTEM**

**PART 1 - GENERAL**

- 1.01 WORK INCLUDED - Work of this Section generally includes provisions for the installation of an underground landscape irrigation system including the following:
- A. Static pressure verification and coordination of irrigation system installation with landscape material installation.
  - B. Trenching, stockpiling excavation materials, refilling and compacting trenches.
  - C. Complete irrigation system including but not limited to piping, backflow preventer assemblies, valves, fittings, heads, controllers and wiring, and final adjustments to insure complete coverage.
  - D. Water connections.
  - E. Replacement of unsatisfactory materials.
  - F. Clean-up, Consultant Reviews, and Project Acceptance.
  - G. Tests.
- 1.02 REFERENCES
- A. Perform Work in accordance with requirements of Conditions of the Contract as well as provisions of all applicable laws, codes, ordinances, rules, and regulations.
  - B. Conform to requirements of reference information listed below except where more stringent requirements are shown or specified in Contract Documents.
    - 1. American Society for Testing and Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section.
    - 2. Underwriters Laboratories (UL) - UL Wires and Cables.
    - 3. National Sanitation Foundation (NSF) – Piping and Backflow prevention.
    - 4. American Water Works Association - Piping and Backflow prevention.
- 1.03 QUALITY ASSURANCE
- A. Installer Qualifications - Installer shall have had considerable experience and demonstrate ability in the installation of irrigation system(s) of specific type(s) in a neat, orderly, and responsible manner in accordance with recognized standards of workmanship. To demonstrate ability and experience necessary for this Project, and financial stability, submit if requested by Consultant, prior to contract award the following:
    - 1. List of 3 projects completed in the last 2 years of similar complexity to this Project. Description of projects shall include:
      - a. Name of project.
      - b. Location.
      - c. Owner.
      - d. Brief description of work and project budget.
  - B. Special Requirements:
    - 1. Work involving substantial plumbing for installation of copper piping, backflow preventer(s), and related work shall be executed by licensed and bonded plumber(s). Secure a permit at least 48 hours prior to start of installation.
    - 2. Tolerances - Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, compaction, and repair of finish grade treatment.

3. Coordination with Other Contractors - Protect, maintain, and coordinate Work with Work under other Section.
  4. Damage To Other Improvements - Contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, or planting done under other Sections during Work associated with installation of irrigation system at no additional cost to Owner.
- C. Pre-Construction Conference - Contractor shall schedule and conduct a conference to review in detail quality control and construction requirements for equipment, materials, and systems used to perform the Work. Conference shall be scheduled not less than 10 days prior to commencement of Work. All parties required to be in attendance shall be notified no later than 7 days prior to date of conference. Contractor shall notify qualified representatives of each party concerned with that portion of Work to attend conference, including but not limited to Architect, Consultant, Contractor's Superintendent, and Installer.
1. Minutes of conference shall be recorded and distributed by Contractor to all parties in attendance within five days of conference.
- 1.04 SUBMITTALS - Prepare and make submittals in accordance with conditions of the Contract.
- A. Materials List - Submit five copies if submitting in hard-copy format or one full electronic set of a complete materials list indicating manufacturer, model number, and description of all materials and equipment to be used. Show appropriate dimensions and adequate detail to accurately portray intent of construction via cut sheets and/or shop drawings, as appropriate based on plans, details, and specification information contained within.
- B. Record Drawings (As-Builts):
1. At onset of irrigation installation secure Autocadd files of original irrigation design from Owner. At the end of every day, revise as-built prints for work accomplished that day in red ink. As-built field prints shall be brought up-to-date at the close of the working day every Friday by a qualified draftsman. A print of record plan(s) shall be available at Project Site. Indicate zoning changes on weekly as-built drawings. Indicate non-pressure piping changes on as-built. Upon completion of Project, but prior to scheduling of substantial acceptance walk-through, submit for review a final set of as-built mylars and an Autocadd disk copy. Dimensions, from two permanent points of reference (building corners, sidewalk, road intersections or permanent structures), location of following items:
    - a. Connection to existing water lines.
    - b. Routing of sprinkler pressure lines (dimension maximum 100 feet along routing).
    - c. Sprinkler control valves.
    - d. Quick coupling valves.
    - e. Manual drains and stop and waste valves.
    - f. Drip line blow-out stubs.
    - g. Control wire routing if not with pressure mainline.
    - h. Gate valves.
    - i. Control wire and communication cable splices
    - j. Water meters
    - k. Locations of all sleeving including size, quantity and depth of sleeve
  2. Owner's Representative will not certify any pay request submitted by the Contractor if the as-built drawings are not current, and processing of pay request will not occur until as-builts are up-dated.
- C. Operation Instructions - Submit 3 written operating instructions including winterization procedures and start-up, with cut sheets of products, and coordinate controller/watering operation instruction with Owner maintenance personnel.
1. Controller Charts:
    - a. Do not prepare charts until Consultant has reviewed record (as-built) drawings.
    - b. Provide one controller chart for each automatic controller installed.
      - i. Chart may be reproduction of record drawing, if scale permits fitting of controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.

- ii. Chart shall be blueline print of actual "as-built" system, showing area covered by that controller.
          - c. Identify area of coverage of each remote control valve, using a distinctly different pastel color drawing over entire area of coverage.
          - d. Following review of charts by Consultant, they shall be hermetically sealed between two layers of 20-mm thick plastic sheet
          - e. Charts shall be completed and reviewed prior to final review of irrigation system.
  - D. Provide documentation of construction and demolition waste debris recycling / salvage rates. See Section 01 74 19 - Construction Waste Management and Disposal
- 1.05 DELIVERY, STORAGE, AND HANDLING - Deliver, unload, store, and handle materials, packaging, bundling, products in dry, weatherproof, condition in manner to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism. Deliver in original unopened packaging containers prominently displaying manufacturer's name, volume, quantity, contents, instructions, and conformance to local, state, and federal law. Remove and replace cracked, broken, or contaminated items or elements prematurely exposed to moisture, inclement weather, snow, ice, temperature extremes, fire, or jobsite damage.
- A. Handling of PVC Pipe - Exercise care in handling, loading and storing, of PVC pipe. All PVC pipe shall be transported in a vehicle that allows length of pipe to lie flat so as not to subject it to undue bending or concentrated external loads. All sections of pipe that have been dented or damaged shall be discarded, and if installed, shall be replaced with new piping.
- 1.06 JOBSITE CONDITIONS:
- A. Protection of Property:
    - 1. Preserve and protect all trees, plants, monuments, structures, and paved areas from damage due to Work of this Section. In the event damage does occur, all damage to inanimate items shall be completely repaired or replaced to satisfaction of Owner, and all injury to living plants shall be repaired by Owner. All costs of such repairs shall be charged to and paid by Contractor.
    - 2. Protect buildings, walks, walls, and other property from damage. Flare and barricade open ditches. Damage caused to asphalt, concrete, or other building material surfaces shall be repaired or replaced at no cost to Owner. Restore disturbed areas to original condition.
  - B. Existing Trees:
    - 1. All trenching or other Work under limb spread of any and all evergreens or low branching deciduous material shall be done by hand or by other methods so as to prevent damage to limbs or branches.
    - 2. Where it is necessary to excavate adjacent to existing trees use all possible care to avoid injury to trees and tree roots. Excavation, in areas where 2 inch and larger roots occur, shall be done by hand. Roots 2 inches or larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a trenching machine is operated close to trees having roots smaller than 2 inches in diameter, wall of trench adjacent to tree shall be hand trimmed, making clean cuts through roots. Trenches adjacent to trees shall be closed within 24 hours, and when this is not possible, side of trench adjacent to tree shall be kept shaded with moistened burlap or canvas.
  - C. Protection and Repair of Underground Lines:
    - 1. Request proper utility company to stake exact location (including depth) of all underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these underground lines from damage. If damage does occur, Utility Owner shall repair all damage. Contractor shall pay all costs of such repairs unless other arrangements have been made.
    - 2. Request Owner, in writing, to locate all private utilities (i.e., electrical service to outside lighting) before proceeding with excavation. If, after such request and necessary staking, private utilities that were not staked are encountered and damaged by Installer, Owner shall repair them at no

## IRRIGATION SYSTEM

cost to Installer. If Contractor damages staked or located utilities, they shall be repaired by Utility Owner at Contractor's expense unless other arrangements have been made.

- D. Replacement of Paving and Curbs - Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition.
- 1.07 WARRANTY/GUARANTY: - Manufacturer shall warrant materials against defects for a period of one year from date of Substantial Completion. Installer(s) shall guaranty workmanship for similar period.
- A. Settling of backfilled trenches that may occur during guaranty period shall be repaired at no expense to Owner, including complete restoration of damaged property.
  - B. Expenses due to vandalism before substantial completion shall be borne by Contractor.
  - C. Owner will maintain turf and planting areas during warranty period, so as not to hamper proper operation of irrigation system.
- 1.08 MAINTENANCE:
- A. Furnish the following maintenance items to Owner prior to final Acceptance:
    - 1. Two Sets of special tools required for removing, disassembling, and adjusting each type of sprinkler head and valve supplied on this Project.
    - 2. One eight foot valve key for operation of stop and waste valve.
    - 3. Two keys for each automatic controller.
    - 4. Two quick coupler keys and two matching hose swivels for each type of quick coupling valve installed.
    - 5. Two aluminum drain valve keys of sufficient length for operation of drain valves.
  - B. Winterization - include cost in bid for winterizing complete system at conclusion of sprinkling season (in which system received final acceptance) within 3 days notification by the Owner. System shall be voided of water using compressed air or similar method reviewed by Consultant. Reopen, operate, and adjust system malfunctions accordingly during April of following season within 3 days of notification by Owner.
- 1.09 EXTRA STOCK - In addition to installed system furnish the following items to Owner:
- A. 10 Pop-up spray heads with nozzles of each type used.
  - B. 4 Rotor heads of each type used.

## PART 2 - PRODUCTS

- 2.01 MATERIALS:
- A. General Piping:
    - 1. Pressure Supply Line (from tap on city mains to winterization tee or Stop and Drain valve prior to backflow prevention unit) – Type "K" Soft Copper (3/4" – 2 1/2").
    - 2. Pressure Supply Lines (downstream of backflow prevention units) – Type "K" Hard Copper (3/4" – 2 1/2"), Class 200 PVC BE (1" - 2 1/2") and Class 200 PVC RT (3" and larger) as noted on plans and schedule.
    - 3. Non-pressure Lines - Class 200 PVC BE, 100PSI NSF polyethylene, 1" minimum size, as noted on plans.
    - 4. Sleeving - Class 160 PVC as noted on plans and schedule.
  - B. Copper Pipe and Fittings:
    - 1. Copper Pipe - Type K, hard tempered or annealed coil.
    - 2. Fittings - Wrought copper, solder joint type.
    - 3. Joints - Soldered with solder, 45% silver, 15% copper, 16% zinc, and 24% cadmium and solidus at 1125~F and liquids at 1145~F.
  - C. Brass Pipe and Fittings:



1. Brass Pipe - 85% red brass, ANSI Schedule 40 screwed pipe.
  2. Fittings - Medium brass, screwed 125-pound class.
- D. Plastic Pipe and Fittings:
1. Identification Markings:
    - a. Identify all pipe with following indelible markings:
      - i. Manufacturer's name.
      - ii. Nominal pipe size.
      - iii. Schedule of class.
      - iv. Pressure rating.
      - v. NSF (National Sanitation Foundation) seal of approval.
      - vi. Date of extrusion.
    2. Solvent Weld Pipe - Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12454-B, Type 1, Grade 1.
      - a. Fittings - Standard Weight, Schedule 40, injection molded PVC; complying with ASTM D1784 and D2466, cell classification 12454-B.
        - i. Threads - Injection molded type (where required).
        - ii. Tees and ells - Side gated.
      - b. Threaded Nipples - ASTM D2464, Schedule 80 with molded threads.
      - c. Teflon Tape – All PVC male threaded fittings and nipples, excluding marlex fittings, shall receive wrapping of Teflon tape applied to threaded surfaces per pipe manufacturer's recommendations.
      - d. Joint Cement and Primer - Type as recommended by manufacturer of pipe and fittings.
- E. Gate Valves:
1. Gate Valves for 3/4 inch through 2-1/2 Inch Pipe - Brass construction; solid wedge, IPS threads, and non-rising stem with cross operating handle.
  2. Gate Valves for 3 Inch and Larger Pipe - Iron body, brass or bronze mounted AWWA gate valves with a clear waterway equal to full nominal diameter of valve; rubber gasket or mechanical joint-type only. Valves shall be able to withstand a continuous working pressure of 200 psi and be equipped with a square operating nut and resilient wedge. Provide pipe restraints on gate valves 3 inches or larger as detailed.
- F. Quick Coupling Valves - Brass two-piece body designed for working pressure of 120 PSI; operable with quick coupler. Equip quick coupler with locking rubber cover.
- G. Valve Boxes:
1. Gate Valves, Quick Coupling Valves, Drain Valves, Drip Line Blow-out Stubs, and Wire Splice or Stub Box - Carson Brooks #910-10 as detailed.
  2. 1 inch through 2 inch Control Valves, Master Valves, Pressure Regulating Valves and Communication Cable Splice box, Sub-meters - Carson Brooks #1419-12 box as detailed.
- H. Electrical Control Wiring:
1. Low Voltage:
    - a. Electrical Control Wire - AWG UFUL approved No. 14 direct burial copper wire or larger, if required to operate system as designed.
    - b. Electrical Common Wire - AWG UFUL approved No. 14 direct burial copper wire or larger, if required to operate system as designed.
    - c. Wire Colors:
      - i. Control Wires - Red.
      - ii. Common Wires - White.
      - iii. Master Valve Wires - Blue.
      - iv. Drawing Spare Control Wires - Black.
      - v. Drawing Spare Common Wires - Yellow.
      - vi. Maintenance Spare Control Wires - Green.
      - vii. Maintenance Spare Common Wires - Brown.

- d. If multiple controllers are utilized, and wire paths of different controllers cross each other, both common and control wires from each controller shall be different colors approved by Consultant.
- e. Control Wire connections and splices shall be made with 3M DBY or King 600 DBY/R direct bury splice, or as required by the controller manufacturer.
- 2. High Voltage - Type required by local codes and ordinances, of proper size to accommodate needs of equipment serviced.
  - I. Electric Control Valves - Size and type shown on Drawings having Purple manual flow adjustment and manual bleed nut.
  - J. Sprinkler Heads - As indicated on Drawings. Fabricated riser units in accordance with details on Drawings - with fittings and nipples of equal diameter as riser inlet in sprinkler body.

### PART 3 - EXECUTION

#### 3.01 SITE CONDITIONS, LANDSCAPE PLAN REVIEW AND COORDINATION

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

#### 3.02 STATIC PRESSURE VERIFICATION - Contractor shall field verify the static pressure at the project site, prior to commencing work or ordering irrigation materials, and submit findings, in writing, to Consultant. If Contractor fails to verify static water pressure prior to commencing work or ordering irrigation materials, Contractor shall assume responsibility for all costs required to make system operational and the costs required to replace any damaged landscape material. Damage shall include all required material costs, design costs and plant replacement costs.

#### 3.03 INSPECTION: - Examine areas and conditions under which Work of this Section is to be performed. Do not proceed with Work until unsatisfactory conditions have been corrected.

- A. Grading operations, with the exception of final grading, shall be completed and approved by Owner before staking or installation of any irrigation system begins.
- B. Underground Utilities shall be installed prior to installation of irrigation system. If irrigation installation takes place prior to utility installation, Contractor shall notify Owner of this condition in writing prior to commencement of irrigation installation.

#### 3.04 PREPARATION:

- A. Staking shall Occur as Follows:
  - 1. Mark, with powdered lime, routing of pressure supply line and flag heads for first few zones. Contact Consultant 48 hours in advance and request review of staking. Proposed locations of all trees shall be field staked by Contractor and approved by Owner/Landscape Architect prior to Consultant review of irrigation staking. Consultant will advise installer as to the amount of staking to be prepared. Consultant will review staking and direct changes if required. Review does not relieve installer from coverage problems due to improper placement of heads after staking.

2. Contractor shall contact Consultant if field spacing varies by +/- 10% of the spacing shown on the irrigation plans. If Contractor fails to notify Consultant of variances exceeding 10%, Contractor assumes full responsibility for the costs associated with any required system modifications deemed necessary by the Consultant or Owner.
  3. If Project has significant topography, freeform planting beds, or other amenities, which could require alteration of irrigation equipment layout as deemed necessary by Consultant, do not install irrigation equipment in these areas until Consultant has reviewed equipment staking.
- B. Install sleeving under asphalt paving and concrete walks, prior to concreting and paving operations, to accommodate piping and wiring. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content in accordance with STM D1557.
- C. Trenching - Trench excavation shall follow, as much as possible, layout shown on Drawing. Dig trenches straight and support pipe continuously on bottom of trench. Trench bottom shall be clean and smooth with all rock and organic debris removed.
1. Clearances:
    - a. Piping 3 Inches and Larger - Make trenches of sufficient width (14 inches minimum) to properly assemble and position pipe in trench. Minimum clearance of piping 3 inches or larger shall be 5 inches horizontally on both sides of the trench.
    - b. Piping Smaller than 3 Inches - Trenches shall have a minimum width of 7 inches.
    - c. Line Clearance - Provide not less than 6 inches of clearance between each line and not less than 12 inches of clearance between lines of other trades.
  2. Pipe and Wire Depth:
    - a. Pressure Supply Piping – 24 inches from top of pipe minimum or as noted on plans.
    - b. PVC Sleeving – To match depth of sleeved material.
    - c. Non-pressure Piping (rotor) - 18 inches from top of pipe.
    - d. Non-pressure Piping (pop-up) - 14 inches from top of pipe.
    - e. Control Wiring/Communication Cable - Side of pressure main or at 18 inch depth if installed in a separate trench with no mainline piping.
  3. Boring will be permitted only where pipe must pass under obstruction(s) which cannot be removed. In backfilling bore, final density of backfill shall match that of surrounding soil. It is acceptable to use sleeves of suitable diameter installed first by jacking or boring, and pipe laid through sleeves. Observe same precautions as though pipe were installed in open trench.
  4. Vibratory Plow - Non-pressure piping may be installed through use of vibratory plow method if consultant determines soil conditions are satisfactory for this method of installation. Vibratory plowing does not relieve installer of minimum pipe depths.
- 3.05 INSTALLATION - Locate other equipment as near as possible to locations designated. Consultant shall review deviations prior to installation.
- A. PVC Piping - Snake pipe in trench as much as possible to allow for expansion and contraction. Do not install pipe when air temperature is below 40 degrees F. Place manual drain valves at low points and dead ends of pressure supply piping to insure complete drainage of system. When pipe installation is not in progress, or at end of each day, close pipe ends with tight plug or cap. Perform Work in accordance with good practices prevailing in piping trades.
1. Solvent Weld PVC Pipe - Lay pipe and make all plastic to plastic joints in accordance with manufacturer's recommendations.
  2. Flexible Plastic (Polyethylene) Pipe - Lay pipe and assemble fittings following manufacturer's recommendations.
- B. Control Wiring:
1. Low Voltage Wiring:
    - a. Bury control wiring between controller and electric valves in pressure supply line trenches, strung as close as possible to main pipe lines with such wires to be consistently located below and to one side of pipe, or in separate trenches.
    - b. Bundle all 24 volt wires at 10 foot intervals and lay with pressure supply line pipe to one side of the trench.

## IRRIGATION SYSTEM

- c. Provide an expansion loop at every pressure pipe angle fitting, every electric control valve location (in valve box), and every 500 feet. Form expansion loop by wrapping wire at least 8 times around a 3/4 inch pipe and withdrawing pipe.
  - d. Make all splices and E.C.V. connections using 3M DBY, King 600 DBR/Y connectors, or similar dry splice method.
  - e. Install all control wire splices not occurring at control valve in a separate splice valve box.
  - f. Install one control wire for each control valve.
  - g. Maintenance spare wires - In addition to spare wires labeled on drawings, extend two spare #14 AWG UFUL control wires and one spare #14 AWG UFUL common wire from controller pedestal to the end of each and every leg of mainline. Label maintenance spare wires at controller and wire stub box.
2. High Voltage Wiring for Automatic Controller:
    - a. Provide 120 volt power connection to automatic controller. All electric work shall conform to local codes, ordinances, and authorities having jurisdiction. All high voltage electrical work shall be performed by licensed electrician.
- C. Electric Control Valves - Install cross-handle four inches below finished grade where shown on Drawings as detailed. When grouped together, allow minimum of 12 inches between valve box sides. Install each remote control valve in a separate valve box. Install valve box flush with grade or when present flush with surfacing material (rock mulch). When parallel to roadway, sidewalk or other permanent element or structure, control valve and box to be installed perpendicular to element or structure, spaced equally.
- D. Quick Coupling Valves - Install quick couplers on swing-joint assemblies as indicated on construction details; plumb and flush to grade. Angled nipple relative to pressure supply line shall be no more than 45 degrees and no less than 10 degrees.
- E. Drain Valves - Install one manual drain valve on pressure supply line directly downstream of backflow preventer and at all low points in pressure supply line as detailed. Provide a three cubic foot drainage sump for drain valve as detailed.
- F. Valve Boxes:
1. Install one valve box for each type of valve installed as detailed. Valve box extensions are not acceptable except for master valves and flow sensors. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted.
  2. Brand controller letter and station number on lid of each valve box. Letter and number size shall be no smaller than 1 inch and no greater in size than 1 1/2 inches. Depth of branding shall be no more than 1/8 inch into valve box lid.
  3. Concrete polymer boxes shall be labeled with branded inserts per manufacturer's recommendations.
- G. Gate Valves - Install where shown on Drawings as detailed.
- H. Sprinkler Heads - Install sprinkler heads where designated on Drawings or where staked. Set to finish as detailed. Spacing of heads shall not exceed the maximum indicated on Drawing unless re-staked as directed by Consultant. In no case shall the spacing exceed maximum recommended by manufacturer. Install heads on swing joints or riser assemblies as detailed. Adjust part circle heads for proper coverage. Adjust heads to correct height after sod is installed. Plant placement shall not interfere with intended sprinkler head coverage, piping, or other equipment. Consultant may request nozzle changes or adjustments without additional cost to the Owner.
- I. Backfilling - Do not begin backfilling operations until required system tests have been completed. Backfill shall not be done in freezing weather except with review by Consultant. Leave trenches slightly mounded to allow for settlement after backfilling is completed. Trenches shall be finish graded prior to walk-through of system by Consultant.
1. Materials - Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of rubbish, vegetable matter, frozen materials, and stones larger than 1

inch in maximum dimension. Do not mix subsoil with topsoil. Material not suitable for backfill shall be hauled away. Contractor shall be responsible for providing suitable backfill if excavated material is unacceptable or not sufficient to meet backfill, compaction, and final grade requirements.

2. Do not leave trenches open for a period of more than 48 hours. Open excavations shall be protected in accordance with OSHA regulations.
3. Compact backfill to 90% maximum density, determined in accordance with ASTM D155-7 utilizing the following methods:
  - a. Mechanical tamping.
  - b. Puddling or ponding. Puddling or ponding and/or jetting is prohibited within 20'-0" of building or foundation walls.

J. Piping Under Paving:

1. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete or concrete paving.
2. Piping located under areas where asphalt or concrete paving will be installed shall be bedded with sand (a layer 6" below pipe and 6" above pipe).
3. Compact backfill material in 6" lifts at 90% maximum density determined in accordance with ASTM D1557 using manual or mechanical tamping devices.
4. Set in place, cap, and pressure test all piping under paving, in presence of Owner prior to backfilling and paving operations.
5. Piping under existing walks or concrete pavement shall be done by jacking, boring, or hydraulic driving, but where cutting or breaking of walks and/or concrete is necessary, it shall be done and replaced at not cost to Owner. Obtain permission to cut or break walks and/or concrete from Owner.

K. Water Supply and Point of Connection - Water supply shall be extended as shown from water supply lines.

3.06 FIELD QUALITY CONTROL:

- A. Flushing - After piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads, quick coupler assemblies, and hose valves, thoroughly flush piping system under full head of water pressure from dead end fittings. Maintain flushing for 5 minutes through furthest valves. Cap risers after flushing.
- B. Pressure Testing - Conduct test in presence of Consultant. Arrange for presence of Consultant 48 hours in advance of testing. Supply force pump and all other test equipment. Compressed air shall not be used for pressure testing system.
  1. After backfilling, and installation of all control valves, fill pressure supply line with water, and pressurize to 40 PSI over the designated static pressure or 120 PSI, whichever is greater, for a period of 2 hours.
  2. Leakage, Pressure Loss - Test is acceptable if no loss of pressure is evident during the test period.
  3. Leaks - Detect and repair leaks.
  4. Retest system until test pressure can be maintained for duration of test.
  5. Before final acceptance, pressure supply line shall remain under pressure for a period of 48 hours.
  6. Pressure test shall be scheduled and passed prior to scheduling of Substantial Completion Walk-through.
- C. Walk-Through for Substantial Completion:
  1. Arrange for Consultant's presence 48 hours in advance of walk-through.
  2. Entire system shall be completely installed and operational prior to scheduling of walk-through.
  3. Operate each zone in its entirety for Consultant at time of walk-through and additionally, open all valve boxes if directed.

4. Generate a list of items to be corrected prior to Final Completion.
  5. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.
  6. During walk-through, expose all drip emitters under operations for observation by Consultant to demonstrate that they are performing and installed as designed, prior to placing of all mulch material. Schedule separate walk-through if necessary.
  7. Supply Consultant with prints of irrigation as-builts prior to scheduling substantial completion walk-through.
- D. Walk-Through for Final Completion:
1. Arrange for Consultant's presence 48 hours in advance of walk-through.
  2. Show evidence to Consultant that Owner has received all accessories, charts, record drawings, and equipment as required before Final Completion walk-through is scheduled.
  3. Operate each zone, in its entirety for Consultant at time of walk-through to insure correction of all incomplete items.
  4. Items deemed not acceptable by Consultant shall be reworked to complete satisfaction of Consultant.
  5. If after request to Consultant for walk-through for Final Completion of irrigation system, Consultant finds items during walk-through which have not been properly adjusted, reworked, or replaced as indicated on list of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in amount equal to additional time and expenses required by Consultant to conduct and document further walk-throughs as deemed necessary to insure compliance with Contract Documents.
- 3.07 ADJUSTING - Upon completion of installation, fine-tune entire system by adjusting patterns and break-up pins, and setting pressure reducing valves at proper and similar pressure to provide optimum and efficient coverage. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. Heads of same type shall be operating at same pressure +/- 10%.
- A. If it is determined that irrigation adjustments will provide proper coverage, and improved water distribution as determined by Consultant, contractor shall make such adjustments prior to Final Acceptance, as directed, at no additional cost to Owner. Adjustments may also include changes in nozzle sizes, degrees of arc, and control valve throttling.
  - B. All sprinkler heads shall be set perpendicular to finish grade unless otherwise noted on Construction Plans or directed by Consultant.
  - C. Areas which do not conform to designated operation requirements due to unauthorized changes or poor installation practices shall be immediately corrected at no additional cost to the Owner.
- 3.08 CLEANING - Maintain continuous cleaning operation throughout duration of work. Dispose of, off-site at no additional cost to Owner, all trash or debris generated by installation of irrigation system.
- A. Comply with the requirements of DIVISION 1, General Requirements, and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for recycling and salvage of debris and waste.
  - B. Comply with the requirements of Section 31 25 00, TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN for preparation and protection of the site.

**END OF SECTION**

**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, design and aesthetics of the furnishings will be considered.
  - C. Submit all color samples for all site furnishings and shelters
- 1.4 RELATED WORK:
- A. Concrete Walks, Curbs & Miscellaneous Flatwork - Section 02520.

**PART 2: PRODUCTS**

- 2.1 TRASH RECEPTACLES: Refer to plans.
- 2.2 PICNIC TABLES: Refer to plans.

**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 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. Sodding – Section 02935
  - D. 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, no approved substitutes.

### 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 features, existing or newly constructed, 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 and Shrub Bed areas:
  1. Evenly distribute soil conditioner and first application of fertilizer at the following rates:
    - a. Soil conditioner at the rate of 4 cu.yds. per 1,000 square feet for sodded areas, 4 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. Allow for specified mulch depth in shrub bed areas.
  4. Noxious weeds or parts thereof shall not be present in the surface grade prior to planting or sodding.
  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. Sodding: Section 02935
  - D. 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.
- 2.2 IMPORTED TOPSOIL: All topsoil shall be a loam or sandy loam. At least ten (10) days prior to topsoil delivery, notify Project Manager of the source(s) from which topsoil is to be furnished. Topsoil shall be furnished by the Contractor and shall be a natural, friable soil representative of productive soils and shall meet the following conditions;
  - A. It shall be obtained from the top twelve inches (12") of well drained areas.
  - B. Fertile, friable, loamy soil, reasonably free from subsoil, refuse, roots, heavy or stiff clay, stones larger than one inch (1"), coarse sand, noxious seeds, sticks, brush, litter, and other deleterious substances; suitable for the germination of seeds and the support of vegetative growth. The PH value shall be between seven and eight (7.0 and 8.0).
  - C. Soil Texture: Sand, thirty to fifty percent (30% - 50%); silt, thirty to fifty percent (30% - 50%) percent; clay, five to thirty percent (5% - 30%).

- D. Additives: As determined by soil fertility tests.
- E. Percent Organic Content: two point nine percent (2.9%) minimum.
- F. Soluble Salts: Electric conductivity shall be less than three point three (3.3) mmhos/cm for dryland areas and less than five (5.0) mmhos/cm for irrigated lands.

### PART 3: EXECUTION

#### 3.1 PLACING TOPSOIL:

- A. Scarify compacted subgrade to a 6-inch depth to bond topsoil to subsoil. Place topsoil to a minimum depth of 6-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.
- B. Utilize salvaged topsoil as the top layer to the extent available. If sufficient on-site material is not available, the Contractor shall furnish and install imported topsoil in the manner described above. Topsoil shall mixed thoroughly with the salvaged topsoil prior to placement.

END OF SECTION 02925

**PART 1: GENERAL**

- 1.1 RELATED DOCUMENTS: The General Contract Conditions, Drawings and Division - 1 Specification sections apply to Work of this section.
- 1.2 SUMMARY:
- A. Work Included: Furnish and install bluegrass sod and maintain sodded areas until Final Acceptance.
- B. Related Work:
1. Watering - Section 02233
  2. Irrigation System - Section 02810
  3. Soil Preparation - Section 02920
  4. Topsoil – Section 02925
  5. Trees and Shrubs - Section 02950
- 1.3 SUBMITTALS:
- A. Quality Control Submittals:
1. Certificates: State, Federal and other inspection certificates shall accompany the invoice for materials showing source or origin. Submit to Owner's Representative 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 Owner's Representative.
- 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. Owner's Representative reserves the right to reject at any time or place prior to acceptance, any work and sod which in the Owner's Representative's opinion fails to meet these specification requirements.
  2. Inspection: Primarily for quality; however, other requirements are not waived even though visual inspection results in acceptance. Notify Owner's Representative 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 Owner's Representative.

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: Large rolls, 4' wide x 100' length, 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 Owner's Representative.

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 Owner's Representative. Repair damage to prepared grounds and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to Owner.

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 Owner's Representative, are too hot, dry, windy or other condition that is deemed unfavorable for optimal installation may be prohibited.

1.7 MAINTENANCE:

A. Substantial Completion:

1. The Owner's Representative 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 Owner's Representative 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 Owner's Representative the Owner's Representative 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 Owner's Representative.
3. Watering: Initially water sod upon completion of convenient work areas until installation is complete and the irrigation system can be operated under full control. Water sod sufficiently to moisten subsoil at least 4" deep in a manner not to cause erosion or damage to adjacent finished surfaces. Water shall be free of substances harmful to plant growth. Be responsible for furnishing water from underground sprinkler system, quick couplers or other source.
4. Fertilizing: Within 30 days of sodding and every 30 days thereafter until final acceptance, apply specified fertilizer to maintain optimal sod vigor.
5. Mowing and Trimming: Mow and Trim around trees (keeping mulch in



saucers and beds), walls, fences, etc., maintaining turf at 2½-2-3/4" 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 Owner's Representative.
8. Insect and Disease Control: As required, using insecticides and fungicides approved by Owner's Representative.

C. Final Acceptance:

1. At the end of the Maintenance Period, the Owner's Representative 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 Owner's Representative at that time, the Owner's Representative 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: GTF Bluegrass in 4' wide x 100' length large rolls, Available thru Grafts Turf Farm, Ft. Morgan, Colorado, 1-800-280-TURF, or approved substitute.
- 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 Owner's Representative.
- C. Beginning of installation means acceptance of existing conditions by this Contractor.

### 3.2 PREPARATION:

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

### 3.3 SODDING:

- A. Sodding:
1. Soil on which sod is laid: Slightly moist.
  2. Lay with longest dimension parallel to contours and in continuous rows.
  3. Tightly butt ends and sides of sod together. Stagger and compact vertical joints between sod strips by rolling so sod will be incorporated with the ground surface, insuring tight joints between adjacent pieces. Ensure that sod is neither stretched nor overlapped.
  4. Exposed joints due to shrinkage will require replacement of sod in affected areas.
- B. Topsoil: Add along exposed edges to match adjacent grade. Feather topsoil out approximately 1 ft. from edge of sod. Broom screened topsoil over entire sodded

area to fill voids but do not smother sod.

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

#### 3.4 FERTILIZING:

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

#### 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 Owner's Representative. Clean out drainage inlet structures.

#### 3.7 PROTECTION:

- A. General: Provide and install barriers as required and as directed by Owner's Representative 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. Sodding – Section 02935

**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/or 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: Spunbonded 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, or 6-foot tall 2"x2" lodgepole stakes.
- B. Guy and Tie Wire: 12 gauge galvanized wire. All guy and tie wires shall be covered with ¾ inch to 1-inch diameter PVC pipe, white on entire length of each wire.
- 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 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. Secured at top and bottom and at two-foot intervals up to second branch.

- 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: 4 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-inch (2.5-cm) below adjacent finish grades, unless otherwise indicated.
- D. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.
- E. Wrap trees with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.
  - 1. No tree shall be wrapped after May 21 nor before November 1.
  - 2. All deciduous trees shall be wrapped by November 15. Remove tree wrap by May 15.
  - 3. Contractor shall be responsible for wrapping and unwrapping trees during

the warranty period.

### 3.9 TREE AND SHRUB PRUNING:

- A. Prune, thin, remove injured or dead branches, and shape trees and shrubs as directed by Landscape Architect.

### 3.10 STAKING:

- A. Stake trees per following schedule, then remove at end of first growing season:
  1. 1-1/2" Caliper Size – minimum 1 stake on side of prevailing wind (generally N.W. side).
  2. 1-1/2" – 3 Caliper Size – minimum 2 stakes, one on N.W. side and one on S.W. side.
  3. 3" Caliper Size and Larger – 3 stakes per diagram.

Wire or cable shall be a minimum 12-gauge. Tighten wire or cable only enough to keep from slipping. Allow for some trunk movement. Nylon straps shall be long enough to accommodate 1-1/2" of growth and buffer all branches from wire.

Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire fed through white PVC pipe and tree collar grommets. Allow enough slack to avoid rigid restraint of tree. Twist ends of wire and trim off excess.

- B. Guying and Staking: Guy and stake evergreen trees exceeding 8-feet and deciduous trees more than 5-inch caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30-inches (760-m) long, driven to grade. Feed guy wire through white PVC pipe and hose chafing guard.
- C. Cover tie and guy wires with 1-inch white PVC pipe.

### 3.11 PLANTING GROUND COVER AND PLANTS:

- A. Space ground cover and plants as indicated
- B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

### 3.12 MULCHING:

- A. Mulch backfilled surfaces of pits, planted areas, non-irrigated zones, and other areas indicated.
- B. Pre-Emergent Herbicide: Apply pre-emergent herbicide to all shrub bed areas at the rate recommended by the manufacturer. Do not apply to annual, perennial, or ground cover areas.
- C. Weed-Control Barriers: Install weed-control barriers according to manufacturer's

recommendations, before mulching. Completely cover area to be mulched, lapping and pinning edges a minimum of 6-inches (150-mm).

- D. Organic Mulch: Apply the following average thickness of mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
  - 1. Thickness: 4-inches (75-mm) deep in shrub bed areas.
- E. Mulch tree rings in turf and native grass areas with 4-inch depth specified organic mulch.
- F. Mulch evergreen trees in turf out to dripline with 4-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 plantings and planted areas 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. Sodding - Section 02935
- 1.3 SUBMITTALS:
- A. Notices - Submit the following written notices to the Owner.
    - 1. At initiation of work under this contract, a listing of unhealthy plant materials, safety hazards, problem areas, or other conditions not in conformance with the safe and pleasing environment.
    - 2. A minimum of one (1) week prior to the start-up or winterization of the irrigation system.
    - 3. A minimum of one (1) week prior to fertilization or the broad application of any chemicals or insecticides of any kind.
    - 4. A minimum of one (1) week prior to the end of the maintenance period.
- 1.4 QUALITY ASSURANCE:
- A. Applicable Codes and Standards.
    - 1. Abide by the codes, specifications, and standards of all governmental and industry regulations including but not limited to City, County, State of Colorado, and the standards of the American Association of Nurserymen (ANN), American Society for Testing and Materials (ASTM), National Plumbing Code (NPC), Colorado Technical Plumbing Code, Uniform Building Code (UBC), Sprinkler Irrigation Association (SIA), National electric Code (NEC), American Sod Producers Association (ASPA), United States Department of Agriculture (USDA), and the Association of American Seed Control Officials (AASCO).
    - 2. All labor shall be United States citizens or have current, valid work permits for work within the United States.
    - 3. At all times when work is being performed, Contractor shall have an individual who has successfully completed the Standard First Aid and Personal Safety Course (intermediate level) offered by the American Red Cross or other training as accepted by the Owner.
    - 4. No chemicals or fertilizers shall be utilized on the work without a state licensed operator in attendance.



- B. Acceptance:
  - 1. On or before the expiration of the maintenance period, the Owner and the Contractor shall conduct a final inspection of the work. The Owner shall prepare a list of any defects discovered during such final inspection ("punch list") and submit the punch list to the Contractor. Any additional defects discovered subsequent to the final inspection of the work, but prior to the date of final acceptance (as hereinafter defined) shall also be submitted to the Contractor for repair at the cost and expense of the Contractor. Upon completion by the Contractor of the terms contained on the punch list and any other items subsequently discovered prior to the date of Final Acceptance, the Owner shall deliver a written notice of Final Acceptance to the Contractor.
  
- C. Equipment:
  - 1. All equipment shall be well maintained and equipped with current safety features including audible reverse warning, trimming guards, etc.

1.5 MAINTENANCE PERIOD:

- A. Require full maintenance for all items (sodded areas, tree 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 potable 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, Curbs and Miscellaneous Flatwork - 02520
  - B. Earthwork – 02200
  - C. Aggregate Base Course - 02232
- 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. Planter 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 Contractor.
- 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. 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.
- D. 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.

## 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 straight-edge 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

## **SECTION 05500**

## **MISCELLANEOUS METALWORK**

### **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:

A. Cast-in-Place Concrete - Section 03300

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, or other finish as indicated on plans. 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.

END OF SECTION

PART 1: SITE WORK STANDARDS

1.1 WORK STANDARDS

- A. All work to be completed to the City of Northglenn, Public Right-of-Way Standards and Specifications for the Design and Construction of Improvements. All standards and details are available for download from the City's website at [www.northglenn.org](http://www.northglenn.org)

END OF SECTION

**PART 1 – GENERAL**

- 1.01 Summary
- A. Section Includes:
    - 1. Fencing as indicated to include post footings, gates, and related accessories.
  - B. Related Sections:
    - 1. Cast-in-Place Concrete: Section 03 30 00
- 1.02 Submittals  
Submit shop drawings for fencing and gates, in accordance with Sections 01 33 00.
- 1.03 Quality Assurance  
Reference Standards: Chain link fabric and pipe frame material shall comply with standards and specifications of the Chain Link Fence Manufacturers Institute and the ASTM Standards referenced herein.

**PART 2 - PRODUCTS**

- 2.01 General Materials
- A. Steel components, including fabric, pipe, and fittings shall be first quality, full weight, hot-dipped galvanized materials, meeting ASTM F-1083. Zinc coating shall be applied to interior and exterior of materials and shall conform to ASTM B6, Prime Western Grade. Weight of zinc coating shall be minimum of 1.6 ounces per square foot for steel materials without clear coating; or minimum of 1.0 ounce per square foot for steel materials with manufacturer applied clear coating. Weights and wall thicknesses for pipe materials indicated are minimum. Materials for fence posts and rails shall meet the strength testing requirements for Group IA piping in accordance with ASTM F669. Pipe sizes are listed in this specification as trade or fence industry standard outside diameter (o.d.). Gates shall be constructed in accordance with ASTM F900.
- 2.02 Chain Link Fencing Materials
- A. Fabric: Fabric shall be No. 8 gauge steel wire (except as otherwise shown), woven into a 2" chain link mesh. Fabric shall receive Class 1 zinc coating after weaving in accordance with ASTM A392. Top and bottom selvage of the fabric shall be knuckled.
  - B. Line Posts:
    - 1. 2.375" o.d. schedule 40 steel pipe (up to and including 12' ht.).
  - C. Line Post Tops: Heavy galvanized, eye-top fittings to be set over post snugly.
  - D. Top, Center, and Bottom Rails: 1-5/8" o.d. schedule 40 steel pipe, minimum wall thickness of 0.11 inch. Provide seven (7) inch long expansion sleeve couplings.
    - 1. Top, intermediate and bottom rails.
  - E. Fabric Ties: No. 11 gauge galvanized steel tie wire shall be used to tie fabric to framework. Ties to tension wire shall be made with heavy galvanized hog rings or wire.
  - F. Tension Wire: Two strands of No. 11 gauge galvanized spiral tension wire with attaching fittings.

- G. Terminal Post Tops: End and corner posts shall be fitted with heavy galvanized tops of bullet-type construction.
- H. Terminal Posts:
  - 1. End, corner, and pull posts shall be 2.875" o.d. schedule 40 pipe (up to and including 8' ht.).
- I. Brace Panel Assembly: All end and gate posts shall be braced with 1-5/8" o.d. pipe weighing 1.4 pounds per foot, and adjustable 3/8" galvanized truss rod with malleable iron truss tighteners. Corner posts shall be furnished with two complete brace panel assemblies.
- J. Tension Bands: Beveled edge type with either nuts and bolts or special lock pin type.
- K. Gate Posts: The following list gives minimum gate post sizes for various width swinging gates:

Minimum Gate Post Sizes		Gate Width	
Size	Pounds / Foot	Single	Double
2-3/8" o.d.	Sched. 40	4' and under	8' and under
2-7/8" o.d.	Sched. 40	4' to 8'	Over 8' to 16'

- L. Gates: Gates shall be constructed of steel pipe in accordance with ASTM F900; frame members size and weight as required for size of gate to be constructed. Gate frames shall have fully welded corners. Fabric filler shall be same fabric as used in fence. Hardware shall be heavy duty, galvanized, with lockable latches.
- 2.03 Concrete Post Bases  
Concrete designed to have minimum compressive strength of 3,000 psi at 28 days in accordance with Section 03 30 00.

**PART 3 - EXECUTION**

- 3.01 Installation of Chain Link Fencing
- A. Workmanship: The completed fence shall be plumb, both in line and transverse to the fence, straight and rigid, with fabric tightly stretched and held firmly in place. Gates shall swing easily and hang true and close into the plane of the fence. Details of construction not specified herein or on the drawings, shall be performed in keeping with good standard fencing practice.
  - B. Concrete Bases: Set posts in concrete. Posts shall be allowed to set at least seven (7) days before rails, fabric, and fittings are installed. See drawings for base depths and diameters. Construct concrete mow band as indicated on drawings.
  - C. Line Posts: Space not more than ten (10) feet apart and set in concrete bases.
  - D. Terminal and Gate Posts: Set posts in concrete bases. Terminal posts shall be used at ends and corners of fence runs and at pull posts where bracing is required.
  - E. Top and Bottom Rails: Top and bottom rails shall be set as nearly parallel to the finish grade as possible. Intermediate rails shall be set parallel to the top rail and at an elevation indicated on the drawings. The intermediate rails shall be welded in place with face of rail flush with fabric side of line posts. See Article 2.02, Paragraph D for fence and rail types.

- F. Fabric: Fabric shall be placed on pool side of posts.
- G. Fabric Ties: Minimum of six (6) ties for each 10 feet of rail and one (1) tie to each one foot of post height. Ties to tension wire shall be made with heavy galvanized hog rings or wire at six (6) per 10' of tension wire.
- H. Tension Bands: One (1) fastener for each one (1) foot of fabric height.
- I. Bolted Connections: Tack weld nut to bolt at all bolted connections.

END OF SECTION