



*A place where families and businesses thrive.*

BID SET  
**SPECIFICATIONS**  
INCLUDING SPECIFICATIONS FOR  
PROJECT NO. 2020-1

# **ANNA & ABBY'S YARD AT ROGERS PARK**

2421 - 17<sup>TH</sup> AVENUE  
FOREST GROVE, OR 97116

**OWNER**  
CITY OF FOREST GROVE

**LANDSCAPE ARCHITECTURE**  
MIG, INC.

**CIVIL ENGINEERING**  
MIG, INC.

**ELECTRICAL ENGINEERING**  
R&W ENGINEERING

**STRUCTURAL ENGINEERING**  
STRUCTURAL NEXUS

JANUARY 2020

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INVITATION TO BID  
CITY OF FOREST GROVE  
WASHINGTON COUNTY, OREGON

**ANNA AND ABBY’S YARD AT ROGERS PARK**

Sealed bid proposals for the ANNA AND ABBY’S YARD AT ROGERS PARK will be received at the office of the City Recorder of the City of Forest Grove, 1924 Council Street, PO Box 326, Forest Grove, OR 97116, **until the bid closing time of 10:00 AM local time March 5, 2020. Bids will then be publicly opened and read at 2:00 PM local time on March 5, 2020.**

The work consists of: Construction and coordination of an inclusive nature playground. This includes collaboration with some pre-determined sub-contractors and wood crafters.

Plans and specifications may be on the City’s website at <https://www.forestgrove-or.gov/rfps> or from the Plans Center at Precision Images, 900 SE Sandy Boulevard, Portland, OR 97214 or on their website at <https://vpc.precisionimages.com>.

**The City of Forest Grove will hold a required/mandatory pre-proposal meeting on February 10, 2020, from 9:30 AM to 12:30 PM. This meeting will include a site tour and a visit to the wood crafter in Carlton, Oregon. The meeting will begin at the Community Auditorium located at 1915 Main Street, Forest Grove, OR 97116. The City will not be providing transportation between locations. Attendance is required at all locations.**

Each bid proposal must be submitted on the prescribed form and bid sheet and accompanied by a certified check or bid bond payable to the City of Forest Grove, in an amount not less than five percent (5%) of the amount bid. No bids will be received or considered unless the bid proposal and bid sheet is properly completed and signed.

Each successful bidder will be required to furnish a Performance and Payment Bond for faithful performance of the Contract in the full amount of the Contract price.

Attention is called to the “Prevailing Wage Rates for Public Works Contracts in Oregon”, effective January 1, 2020.

Attention is called to the following:

1. Contractor, its subcontractors, if any, and all employers working under the Contract are subject employers under the Oregon Workers' Compensation Law and shall comply with ORS

656.017, which requires them to provide workers' compensation coverage for all their subject workers.

2. Contractor and all subcontractors must be registered with the Oregon Construction Contractors Board (in compliance with ORS 701.055) and/or the Landscape Contractors Board (in compliance with ORS 671) **prior to bid opening.**

Construction Contractors Board  
and/or  
Landscape Contractors Board  
700 Summer Street, NE, Suite #300  
Salem, OR 97310-0151  
(503) 378-4621

Award shall be made only to responsible contractors that possess the potential ability to perform successfully under the terms and conditions of the contract. Consideration shall be given to contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

The City of Forest Grove reserves the right in its sole discretion to reject any and all bid proposals or to accept any bid proposal which appears to serve the best interest of the City.

For more information regarding this project, contact Tom Gamble at 503.992.3237.

Paul Downey, Director of Administrative Services  
City of Forest Grove

Published:           The Daily Journal of Commerce.  
                          January 31, 2020

## BID PROPOSAL

TO: Anna D. Ruggles, City Recorder  
City of Forest Grove Administration Building  
1924 Council Street (PO Box 326)  
Forest Grove, Oregon 97116

The undersigned, hereinafter referred to as the "Bidder", declares that the only person or parties interested in the Bid Proposal are those named herein; that this Bid Proposal is in all respects fair and without fraud; that it is made without collusion with any official or employee of the City of Forest Grove (the "City") and that the Bid Proposal is made without any connection or collusion with any person making another proposal on this contract.

1. In submitting this bid, Bidder represents the following:
  - (a) Bidder acknowledges receipt of Pre-Bid Conference minutes, if any.
  - (b) Bidder has visited the site and performed all tasks, research, investigation, reviews, examinations, and analysis and given notices, regarding the project and the site, as set forth in Contract Agreement.
  - (c) Bidder has given the City prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the contract documents and actual conditions and the written resolution thereof through addenda issued by the City is acceptable to Bidder.  
The Bidder further agrees as follows:
    - (d) That Bidder has exercised his own judgment regarding the interpretation of surface and subsurface information and has utilized all data which Bidder believes pertinent from the Engineer, City, and other sources in arriving at his conclusions.
    - (e) That all of the applicable provisions of Oregon Law relating to public contracts (ORS Chapter 279) are, by this reference, incorporated in and made a part of this proposal.
    - (f) That if this Proposal is accepted, Bidder shall, if requested by the Engineer, submit a statement of qualifications in a form adopted by the State of Oregon Public Contract Review Board and/or a list of names of subcontractors he intends to utilize in the execution of the contract, within twenty-four (24) hours of the request.

2. The Bidder agrees that if this Bid Proposal is accepted, he will, within ten (10) working days after Notice of Award, execute the contract with the City in the form of Contract Agreement. The Bidder will deliver to the City the insurance certificates, performance and payment bonds herein required within ten (10) working days after the Bidder has received the Notice of Award. The Bidder will, to the extent of the Bid Proposal, furnish all labor, tools, equipment, and other means of construction to do the work and to furnish all materials necessary to complete the work and to furnish all materials necessary to complete the work in the manner, in the time, and according to the methods as specified in the contract documents and as may be required by the Engineer thereunder. It is agreed that if the Bidder is awarded the Contract for the work herein proposed and shall fail or refuse to execute the Contract and furnish the specified Performance Bond and the Labor and Material Payment Bond within ten (10) calendar days after receipt of notification of acceptance of this Proposal, then, in that event, the Bid Proposal Guaranty deposited herewith according to the conditions of the Invitation for Bids and General Conditions shall be retained by the City as liquidated damages; and it is agreed that the said sum is a fair measure of the amount of damage the City will sustain in case the Bidder shall fail or refuse to enter into the Contract for the said work and to furnish the Performance Bond and the Labor and Material Payment Bond as specified in the Contract Documents. Proposal Guaranty in the form of a certified check shall be subject to the same requirements as a bid bond.

3. Upon receipt by the City of the satisfactorily executed contract, insurance certificates, performance and payment bonds, a written Notice to Proceed will be sent to the Contractor. The Bidder further agrees to commence work within ten (10) calendar days after the Notice to Proceed. All work shall be completed within 150 calendar days. Once the contractor has moved onto the project site, work shall commence and continue uninterrupted until fully complete and accepted by the City. In the event the Bidder is awarded the contract and fails to perform the work herein specified, within the time specified for completion, liquidated damages shall be paid to the City in the amount set forth in the contract agreement, for each calendar day beyond the time herein provided for the completion of such work. Sundays and legal holidays will be excluded in determining the number of days in default.

4. All items of the work shall be considered complete and in place, and no additional compensation shall be granted. All of the work required to provide a complete and operational system shall be considered to be included in the listed tasks and no compensation shall be granted for additional items. Compensation for any item of work required by these contract documents but not specifically described in any bid item shall be included in the bid item most clearly related to said item of work.

5. The TOTAL BID PRICE is for all work satisfactorily completed and includes any and all sales and use taxes and levies that may be applicable.

6. The Bidder shall complete the bid schedule in clearly legible figures, the unit price and an item total for the item in the respective spaces provided for this purpose. In the case of unit basis items, the amount set forth under the "TOTAL" column shall be an extension of the unit price bid and the estimated quantity for the item. In case of a discrepancy between the unit price and total set forth for the item, the unit price shall prevail and the total for the item, and therefore the "TOTAL BASE BID AMOUNT", shall be adjusted accordingly, and the bid award shall be made on the basis of the corrected total base bid amount. The amounts shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.

7. BASIS OF BID COMPARISON & DETERMINATION OF LOW BIDDER: Bids are required for the Entire work. The Amount of the Bid for Comparison and Determination of Low Bidder will be the Total of the Base Bid.

8. All bids must be submitted in ink on the bid forms provided or on a self-created form providing the same information. Changes must be lined out and corrections inserted adjacent and initialed by the Bidder's authorized representative. Bid modifications, corrections or additions received beyond the bid deadline shall not be considered. Telephone or facsimile bids shall not be accepted. Signatures must be original signatures and be notarized where required.

9. The City reserves the right to: (1) reject any or all bids; (2) waive inconsequential defects or minor irregularities in the bid documents or minor variances from the bid specification; and (3) correct arithmetic errors on the bid schedule.

10. Bidder accepts all of the terms and conditions of the contract documents. This bid will remain subject to acceptance for 90 days after the day of bid opening.

11. Bidder agrees that, in accordance with General Conditions, liquidated damages for failure to complete all work in the contract within the time specified in Contract Agreement shall be as set forth in Contract Agreement.

If the Bidder is awarded a Construction Contract on this Bid Proposal, the Surety who will provide the Performance Bond and the Labor and Material Payment Bond will be

\_\_\_\_\_

whose address is:

\_\_\_\_\_  
(Street) (City) (State)

The name of the Bidder who is submitting this Proposal is \_\_\_\_\_  
doing business at:

\_\_\_\_\_  
(Street) (City) (State)

which is the address to which all communications concerned with this Proposal and with the Contract shall be sent.

IN WITNESS WHEREOF, the Bidder named herein on the date affixed hereto has duly executed the Proposal.

BIDDER:

By: \_\_\_\_\_  
Authorized Signature

DATE: \_\_\_\_\_

Oregon Construction Contractors Board  
Registration No.:

\_\_\_\_\_

And/or Oregon Landscape Contractors Board  
Registration No.

\_\_\_\_\_

**BID SCHEDULE**

All bid items, including lump sums and unit prices, must be filled in completely. Bid items are described in the Technical Specifications. Quote in figures only, unless words are specifically requested. Blanks rows have been provided for adding items not specifically noted.

ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL
<b>BASE BID</b>					
1	Mobilization, Site Maintenance and Demobilization				
2	Temporary Facilities and Controls, Tree and Plant Protection				
3	Erosion Prevention and Sediment Control				
4	Traffic Control				
5	Demolition, Clearing and Grubbing				
6	Earth Moving, Excavation, Subgrade Preparation and Grading				
7	Water				
8	Storm Drainage Utilities				
9	Sanitary				
10	Landscape Concrete				
11	Shotcrete				
12	Exterior Carpentry a. Custom Log Benches b. Toadstool Steppers c. "The A's Have It" Armature d. Spirit Poles e. Forest Library f. Stump Armchair g. Mailbox to Heaven h. Entry Stump i. Fallen Giants Log Climber j. Infinity Tree – NOTE: Contractor shall construct shotcrete base; specialty fabricator to provide a template for top of shotcrete base to match base of Infinity Tree. k. Lemon Love Stand l. Woven Willow Fairy Houses				

13	Play Equipment a. Imbarimba b. Small Babel Drum c. 2-Bay Swing Set d. Spinner Bowls e. Parkour Climber f. Integration Carousel g. Steel Frame Fairy House h. Grab Rail at transfer locations				
14	Decomposed Granite				
15	Playground Protective Surfaces a. Poured in Place Playground Surfacing b. Playground Grass Resilient Playground Surfacing				
16	Athletic Court Surfacing and Striping				
17	Site Furnishings a. Signage – donor sign, welcome signs, standard City park signs				
18	Irrigation System				
19	Planting				
20	Landscape Rock				
21	Operations and Maintenance Period				
<b>OTHER ITEMS NOT SPECIFICALLY LISTED ABOVE:</b>					
<b>TOTAL</b>					<b>\$</b>

BASE BID–TOTAL OF BASE BID ITEMS 1-21 plus any noted additions \$ \_\_\_\_\_  
 TOTAL BID PRICE FOR BID COMPARISON & DETERMINATION OF LOW BIDDER (IN WORDS):

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**BID BOND**

LET THE FOLLOWING BE KNOWN, THAT \_\_\_\_\_, hereinafter called the Principal, and \_\_\_\_\_, a corporation duly organized under the laws of the State of \_\_\_\_\_, having its principal place of business at \_\_\_\_\_, in the State of \_\_\_\_\_ and authorized to do business in the State of Oregon, as Surety, are held and firmly bound unto the \_\_\_\_\_, hereinafter called the Obligee in the penal sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_), for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The condition of this Bond is such that, whereas, the Principal herein is herewith submitting his or its Bid Proposal for \_\_\_\_\_ said Bid Proposal, by reference thereto, being hereby made a part hereof.

NOW, THEREFORE, if the said Bid Proposal submitted by the said Principal be accepted, and the Contract be awarded to said Principal, and if the said Principal shall execute the proposed Contract and shall furnish the Performance Bond and Payment Bond as required by the Bidding and Contract Documents within the time fixed by said Documents, then this obligation shall be void, otherwise to remain in full force and effect.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Surety

Countersigned:

By: \_\_\_\_\_  
Attorney-In-Fact

Resident Agent

# **FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM**

**Project Name:** Anna and Abby's Yard @ Rogers Park

**Bid No.:** \_\_\_\_\_

**Bid Closing:** **Date:** March 5, 2020 **Time:** 10 AM

**Disclosure Deadline:** **Date:** March 5, 2020 **Time:** 12 noon

This form must be submitted within two (2) working hours of the advertised bid closing date and time; no later than the **DISCLOSURE DEADLINE** stated above.

CHECK THIS BOX IF YOU WILL NOT BE USING ANY FIRST-TIER SUBCONTRACTORS.

List below the Name, Address, Dollar Value, Construction Contractor Board (CCB) number if required, Contact Name and Telephone Number of each subcontractor that will be furnishing labor or materials that are required to be disclosed. Enter "NONE" if there are no subcontractors that need to be disclosed. *(If needed, attach additional sheets).*

**Name:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Contact:** \_\_\_\_\_ **Phone No.:** \_\_\_\_\_  
**Dollar Value:** \_\_\_\_\_ **CCB No.:** \_\_\_\_\_

**Name:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Contact :** \_\_\_\_\_ **Phone No.:** \_\_\_\_\_  
**Dollar Value:** \_\_\_\_\_ **CCB No.:** \_\_\_\_\_

**Name:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Contact :** \_\_\_\_\_ **Phone No.:** \_\_\_\_\_  
**Dollar Value:** \_\_\_\_\_ **CCB No.:** \_\_\_\_\_

The above listed first-tier subcontractor(s) are providing labor and/or materials with a Dollar Value equal to or greater than:

- a) 5% of the total Contract Price, but at least \$15,000 (including all alternates). IF the Dollar Value is less than \$15,000 do not list the subcontractor above; or
- b) \$350,000 regardless of the percentage of the total Contract Price.

**FAILURE TO SUBMIT THIS FORM BY THE DISCLOSURE DEADLINE WILL RESULT IN A BID SUBMITTED BECOMING NON-RESPONSIVE, AND SUCH BIDS SHALL NOT BE CONSIDERED FOR AWARD!**

Bids which are submitted by Bid Closing, but for which the separate disclosure submittal has not been made by the specified deadline, are not Responsive and shall not be considered for Contract award.

**Form Submitted by Bidder Name:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_ **Phone No.:** \_\_\_\_\_

**Deliver Form to Agency:** \_\_\_\_\_

**Person Designated to Receive Form:** \_\_\_\_\_

**Agency's Address:** \_\_\_\_\_ **Phone No.:** \_\_\_\_\_

**UNLESS OTHERWISE STATED IN THE ORIGINAL SOLICITATION, THIS DOCUMENT SHALL NOT BE FAXED. IT IS THE RESPONSIBILITY OF BIDDERS TO SEPARATELY SUBMIT THIS DISCLOSURE FORM AND ANY ADDITIONAL SHEETS, WITH THE BID NUMBER AND PROJECT NAME CLEARLY MARKED, AT THE LOCATION INDICATED BY THE SPECIFIED DISCLOSURE DEADLINE. SEE INSTRUCTIONS TO BIDDERS.**

**ACKNOWLEDGEMENT OF ADDENDA**

***Anna and Abby's Yard at Rogers Park***

***Bid Date: March 5, 2020***

*Addenda No.:* \_\_\_\_\_ *Date Received:* \_\_\_\_\_

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

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

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

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

CONTRACT FOR CONSTRUCTION

THIS CONTRACT, made and entered into this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between CITY OF FOREST GROVE, hereinafter called the "Owner", and \_\_\_\_\_, of \_\_\_\_\_, hereinafter called the "Contractor".

WITNESSETH:

Said Contractor, in consideration of the sum to be paid him by the said Owner and of the covenants and agreements herein contained, hereby agrees at his own proper cost and expense to do all the work and furnish all the materials, tools, labor, and all appliances, machinery and appurtenances for the construction of:

*Anna and Abby's Yard at Rogers Park*

to the extent of the Bid Proposal made by the Contractor on the \_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_, all in full compliance with the Contract Documents referred to herein.

The signed copy of the Bid Proposal made by the Contractor on the \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, the fully executed Performance Bond and Payment Bond, the General Conditions and the Specifications, entitled **Anna and Abby's Yard at Rogers Park**, dated \_\_\_\_\_, are hereby referred to and by reference made a part of this Contract (as fully and completely as if the same were fully set forth herein) and are mutually cooperative therewith.

In consideration of the faithful performance of the work herein embraced, as set forth in these Contract Documents, and in accordance with the direction of the Landscape Architect and to his satisfaction to the extent provided in the Contract Documents, the Owner agrees to pay to the Contractor the amount bid as adjusted in accordance with the Bid Proposal as determined by the Contract Documents, or as otherwise herein provided, and based on the said Proposal made by the Contractor, and to make such payments in the manner and at the times provided in the Contract Documents.

The Contractor agrees to meet with the Landscape Architect for a pre-construction conference within seven (7) calendar days after the execution of this Contract to review and submit the Contractor's schedule of expected events, as specified in the General Conditions.

The Contractor agrees to complete the work within the time specified in the Bid Proposal and to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the said Proposal.

The Contractor agrees to indemnify and save harmless the Owner from any and all defects appearing to develop in the workmanship or materials performed or furnished under this Contract for a period of one (1) year after the date of the written notice from the Landscape Architect recommending final acceptance of the entire project by the Owner.

In the event that the Contractor shall fail to complete the work within the time limit or the extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid as specified in the General Conditions.

The Contractor agrees that in the event there is any dispute between the parties arising out of this agreement, it shall be determined in Washington County, Oregon, and the prevailing party will be entitled to all costs whether or not arbitration, or suit or action is instituted, including without limitation, reasonable attorney's fees during arbitration, at trial, on appeal, and in connection with enforcement of any judgement.

IN WITNESS WHEREOF, we, the parties hereto, each herewith subscribe the same this \_\_\_\_ day of \_\_\_\_\_, A.D., 20\_\_\_\_.

CONTRACTOR:

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

OWNER: CITY OF FOREST GROVE

\_\_\_\_\_  
By: Michael Jesse VanderZanden  
Title: City Manager

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That \_\_\_\_\_ as Principal, and \_\_\_\_\_ authorized to transact Surety Business, in the State of Oregon, as Surety are held and firmly bound unto the City of Forest Grove, Oregon, hereinafter called the Obligee, in the penal sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_). For the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

**THE CONDITION OF THIS BOND IS AS FOLLOWS:**

WHEREAS, The said Principal herein has made and entered into a certain Contract, a copy of which is attached hereto, with the City of Forest Grove, Oregon, which Contract, together with the applicable Plans, Specifications, and Bid Proposal, is by this reference made a part hereof, and is hereinafter referred to as the Contract.

This Performance Bond shall guarantee the improvement against defects in materials or workmanship for a period of one (1) year from the date of written acceptance by the City of Forest Grove.

NOW, THEREFORE, If the Principal herein shall faithfully and truly observe and comply with the terms of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by him undertaken to be performed under said Contract, upon the terms set forth therein and within the time prescribed therein, and shall indemnify and save harmless the City of Forest Grove, its officers, employees and agents, against any direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the said Contract by the said Principal or his subcontractors and to all persons supplying to the prosecution of the work, or any part thereof, provided for in said Contract, and shall pay all contributions or amounts due the State Industrial Accident Fund and incurred in the performance of said Contract, and pay all sums of money withheld from the employees of said Principal and payable to the Department of Revenue, pursuant to ORS 315.757 or 316.575, and shall promptly as due, make payment to any persons, co-partnership, association, or corporation furnishing medical, surgical, and hospital care or attention incident to sickness or injury to the employees of such Principal; and shall pay all other just debts, dues and demands incurred in the performance of the said Contract and shall pay the City of Forest Grove such damages as may accrue to the City under said Contract and shall in all respects perform said Contract according to law, then this obligation is to be void, otherwise to remain in full force and effect.

This bond is given and received under the authority of Chapter 279C, Oregon Revised Statutes, the provisions of which are hereby incorporated into this bond and made a part hereof. Nonpayment of the bond premium will not invalidate this bond, nor shall the City of Forest Grove be obligated for its payment.

IN WITNESS WHEREOF, the seal and signature of the said Principal is hereto affixed, and the corporate seal and name of the said Surety is hereto affixed and attested by its duly authorized attorney-in-fact and agent at:

---

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

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

Witness of Attest:

By: \_\_\_\_\_  
Attorney-In-Fact

Surety

Countersigned:

By:  
Resident Agent

**LABOR AND MATERIAL PAYMENT BOND**

LET THE FOLLOWING BE KNOWN:

That \_\_\_\_\_

As Principal, and \_\_\_\_\_  
duly authorized to transact Surety Business, in the State of Oregon, as Surety are held and firmly bound unto the City of Forest Grove, Oregon, hereinafter called the Obligee, in the penal sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_) for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

**THE CONDITION OF THIS BOND IS AS FOLLOWS:**

WHEREAS, The said Principal herein has made and entered into a certain Contract, a copy of which is attached hereto, with the City of Forest Grove, Oregon, which Contract, together with the applicable Plans, Specifications, and Schedule of Contract prices, is by this reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, If the Principal herein shall make payment promptly, as due to all subcontractors, equipment, supplies, labor or materials for the prosecution of the work, or any part thereof, provided for in said contract, and shall pay all contribution of amounts due its workers compensation carrier and the State Unemployment Compensation Trust Fund from such Contractor or subcontractors incurred in the performance of said contract, and pay all sums of money withheld from the Contractor's employees and payable to the Revenue Department; and shall pay all other just debts, dues and demands incurred in the performance of the said contract and shall pay the City of Forest Grove, such damages as may accrue to the City under said contract, then this obligation is to be void, otherwise to remain in full force and effect.

This bond is given and received under the authority of Chapter 279C, Oregon Revised Statutes, the provisions of which are hereby incorporated into this bond and made a part hereof. Nonpayment of the bond premium will not invalidate this bond, nor shall the City of Forest Grove be obligated for its payment.

IN WITNESS WHEREOF, the seal and signature of the said Principal is hereto affixed and the corporate seal and name of the said Surety is hereto affixed and attested by its duly authorized attorney-in-fact and agent at: \_\_\_\_\_

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

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

Witness of Attest:

\_\_\_\_\_

By: \_\_\_\_\_  
Attorney-In-Fact  
Surety

Countersigned:

By:  
Resident Agent

A. DEFINITIONS AND ABBREVIATIONS

Unless otherwise defined in the contract documents, the following definitions and abbreviations shall apply wherever used.

The words directed, required, permitted, ordered, requested, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory, or words of like import, refer to actions, expressions and prerogative of the Engineer.

Command type sentences are used throughout the contract documents. In all cases the command expressed or implied is directed to the Contractor.

1. DEFINITIONS

Acts of God

An act of God is to be construed to mean an earthquake, flood, cloudburst, tornado, hurricane or other phenomenon of nature of catastrophic proportions or intensity.

Advertisement

The public announcement inviting bids for work to be performed or materials to be furnished.

Approved Equal

A product, component or process whose use in or on a particular project is specific as a standard for comparison purposes only. The "equal" product, component or process shall be the same or better than that named in function, performance, reliability, quality and general configuration. Determination of equality in reference to the project design requirements will be made by the Engineer.

Attorney

The attorney representing the owner.

Bid Bond

The bond required to be submitted with each proposal as a proposal guarantee.

Bidder

Any individual, firm, co-partnership or corporation submitting a proposal in response to the advertisement calling for bids on the work contemplated.

Calendar Day

Any day shown on the calendar beginning and ending at midnight.

## GENERAL CONDITIONS

### Change Order

A written order, approved by the owner, and issued by the Engineer to the Contractor, covering changes in either the plans, specification, or quantities within the scope of the contract.

### Contract

A part of the contract documents which stipulates conditions on which the work is agreed to be performed, executed by the owner and the Contractor.

### Contract Cost

The aggregate amount of price promised to be paid by the owner to the Contractor upon fulfillment of the contract.

### Contract Documents

The written agreement covering the performance of the work, the advertisement calling for bids, the proposal, plans, all specifications, addenda, permits, contract, contract bonds, change orders in the course of the work, and any approved revisions made during the performance of the work to any of the above listed documents.

### Contract Item

A specific unit of work for which a price or basis of payment is provided in the contract.

### Contracting Agency

The legal entity for which the work is being performed.

### Contractor

Any individual, firm, co-partnership, corporation or any combination thereof who has entered into the contract with the owner. In the case of work being done under permit issued by the owner, the permittee shall be construed to be the Contractor.

### Easement

The right to use a defined area of property for a specific purpose or purposes as set forth in a document which has been made a part of the contract documents.

### Engineer

The Engineer who represents the owner either directly or through his authorized representatives and designated by the contracting agency to supervise the work during its execution.

## GENERAL CONDITIONS

### Extra Work

An item of work not provided for in the contract as awarded but determined by the Engineer as essential to the proper completion of the contract within its intended scope.

### Highway

The whole area within the boundaries of a public right-of-way which is reserved for and secured for public use in constructing and maintaining a roadway and its appurtenances.

### Inspector

The authorized representative of the Engineer entrusted with making detailed inspections of the work or materials.

### Legal Holiday

The following, subject to subsequent change by law, are legal holidays: Sunday, New Years Day, President's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Martin Luther King Jr. Day, Thanksgiving, Christmas, and those days declared as holidays by authorized public proclamation. When a legal holiday, other than Sunday, falls on a Sunday, the immediately following Monday is a legal holiday.

### Loose Riprap

Specified classes of graded rock placed on prepared slope, geotextile, or filter blanket as specified.

### Lump Sum

A method of payment providing for one all inclusive cost for the work or for a particular portion of the work.

### Notice

A written communication delivered to the authorized individual, member of the firm or officer of the corporation for which it is intended. If delivered or sent by mail, it shall be addressed to the last known business address of the individual, firm or corporation. In the case of a contract with two (2) or more persons, firms or corporations, notice to one shall be deemed notice to all.

### Notice to Proceed

A written notice to the Contractor from the Engineer or owner, designating the date the contract term is begun and the date for final completion of the contract.

## GENERAL CONDITIONS

### OSHD Standard Specifications

The latest edition of the specification document published by the State of Oregon entitled "Standard Specifications for Highway Construction", Oregon State Highway Division; available from the Oregon State Highway Division, Salem, Oregon.

### Owner

The legal entity or contracting agency for which the work is being performed.

### Performance Bond

The form of security approved by the owner, furnished by the Contractor and his surety, guaranteeing the complete and faithful performance of all the obligations and conditions placed upon the Contractor by the contract.

### Plans

The official plans, profiles, cross sections, elevations, details and other working, supplementary and detail drawings, or reproductions thereof, signed by the Engineer, which show the location, character, dimension and details of the work to be performed. Plans may either be bound in the same book as the balance of the contract documents or bound in separate sets, and are a part of the contract documents, regardless of the method of binding.

### Proposal

The offer of the bidder to perform work at the prices quoted, submitted on the owner's official proposal form, properly signed and guaranteed.

### Proposal Guaranty

The security furnished with a proposal to assure that the bidder will enter into the contract if the proposal is accepted.

### Provide

When related to an item of work, provide shall be understood to mean furnish and install the work complete in place.

### Reference Specifications

Bulletins, standards, rules, methods of analysis or test, codes and specifications of other agencies, engineering societies, or industrial associations referred to in the contract documents. All such references specified herein refer to the latest edition thereof, including any amendments thereto which are in effect and published at the time of advertising for bids or of issuing the permit for the project.

## GENERAL CONDITIONS

### Right of Way

A general term denoting land, property, or interest therein, acquired for or devoted to public use.

### Road

Every road or roadway, thoroughfare, and place including bridges, viaducts and other structures used or intended for use of vehicles.

### Shown

As used herein, the work shown, or as shown, shall be understood to refer to work shown on the plans in the contract documents.

### Special Specifications (Special Provisions)

Requirements peculiar to the project and changes and modifications of the standard specifications. Special specifications are used interchangeably with special provisions.

### Specified

As used herein the work specified, or as specified, means as required by the contract documents.

### Standard Plans or Drawings

Details of structures, devices, or instructions adopted by the owner as a standard and referred to in the contract documents by title or number.

### Standard Specifications

The terms, directions, provisions and requirements set forth in this document, together with all subsequent addenda and supplements thereto identified as such.

### Station

A distance of 100 feet measured horizontally along a surveyed centerline.

### Street

Any road, highway, parkway, freeway, avenue, alley, walk, or way, including sidewalks, parking strips and all other structures including utilities above and below the surface, land and improvements within the public right of way between property lines.

### Subcontractor

An individual, partnership, firm, corporation, or any acceptable combination thereof,

## GENERAL CONDITIONS

or joint venture to whom the Contractor, with the written consent of the owner, sublets part of the contract.

### Surety

The corporate body which is bound with and for the Contractor, for the acceptable performance of the contract, and for his payment of all obligations arising out of the contract. Where applying to the "Proposal Guaranty", it refers to the corporate body which engages to be responsible for the bidder's execution of a satisfactory contract when and if his bid is accepted by the commission.

### Ton

The short ton of 2,000 pounds avoirdupois.

### Unit Price

A contract item of work providing for payment based on a specified unit of measurement; e.g. linear foot or cubic yard.

### Utility

Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, owned, operated, or maintained in or across a public right-of-way or easement.

### Work

That which is proposed to be constructed or performed under the contract or permit, including the furnishing of all material, labor, tools, machinery and appurtenances necessary to complete the contract.

### Working Day

Any and every calendar day excluding Sundays and legal holidays.

### Working Drawings

Stress sheets, shop drawings, erection plans, falsework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval.

2. ABBREVIATIONS

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AGC	American General Contractors of America
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APWA	American Public Work Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
DEQ	Department of Environmental Quality
DFPA	Division for Product Approval of American Plywood Assoc.
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
ITE	Institute of Traffic Engineers
JIC	Joint Industry Conferences of Hydraulic Manufacturers
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NLMA	National Lumber Manufacturer's Association
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
OSHD	Oregon State Highway Division
PCA	Portland Cement Association
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
WWPA	Western Wood Products Association

## GENERAL CONDITIONS

### B. PROPOSAL REQUIREMENTS

#### 1. PREQUALIFICATION OF BIDDERS

Attention of bidders is called to the requirements of Oregon Revised Statutes, Chapter 279, relating to prequalification of bidders on public contracts. All bidders shall prequalify in accordance with the enacted requirements of the owner.

#### 2. FORM OF PROPOSAL

Bidders shall enclose the proposal, bid bond, or certified check or cashier's check in a sealed envelope, labeled and addressed as required in the Invitation for Bids, and file as required therein.

All proposals shall be clearly and distinctly typed or written. Changes may be made provided the change is initialed.

All proposals shall be on the form furnished by the owner, and in addition to the necessary unit price items and total prices in the column of totals to make a complete bid, all applicable blanks giving general information must be filled in and the bid signed by the Contractor or a duly authorized agent. Any statement accompanying and tending to qualify a bid may cause rejection of such bid, unless such statement is required or permitted.

Unless otherwise specified, bidders shall bid on all bid items included in the proposal and the lower bidder shall be determined in accordance with subsection C-1.

#### 3. WITHDRAWAL, MODIFICATION OR ALTERATION OF PROPOSAL

A proposal may be withdrawn upon written request of the bidder prior to the scheduled closing time for filing bids. Negligence on the part of the bidder in preparing his proposal confers no right to withdraw his proposal after the scheduled closing time for filing bids.

Change in a delivered proposal will be permitted only if a request for making such modification is made in writing, signed by the bidder, and the specific modification is stated and received prior to the scheduled closing time for filing bids.

#### 4. LATE PROPOSALS

Proposals received after scheduled closing time for filing bids will not be opened or considered by the owner unless such bid, if sent through the mails, shows a legible postmark or post office cancellation proving the time of mailing was at least 48 hours prior to the scheduled closing time for filing bids, and such proposal is received before the award has been made.

## **GENERAL CONDITIONS**

### **5. PROPOSAL GUARANTY**

All proposals must be accompanied by a proposal guarantee in the form of a certified check payable to the order of the Owner, or a bidder's bond for the single bid submitted, in an amount not less than five (5) percent of the total amount of the proposal submitted. Such proposal guarantee may be forfeited as liquidated damages in case the bidder shall fail or neglect to furnish a performance bond and insurance, as required, or to execute the contract within ten days after receiving said contract from the owner for execution.

### **6. EXAMINATION OF PLANS, STANDARD PLANS OR DRAWINGS, SPECIFICATIONS AND SITE OF WORK**

Bidders shall determine for themselves all the conditions and circumstances affecting the project or the cost of the proposed work by personal examination of the site, the Contract Documents, and by such other means as they may choose. It is understood and agreed that information regarding underground or other conditions or obstruction indicated in the Contract Documents has been obtained by the owner from data at hand. There is no expressed or implied agreement that such conditions are fully or correctly shown, and the bidder must take into consideration the possibility that conditions affecting the cost or quantity of work may differ from those indicated.

### **7. INTERPRETATION OF CONTRACT DOCUMENTS**

If it should appear to a bidder that the work to be done or matters relative thereto are not sufficiently described or explained in the Contract Documents or that the Contract Documents are not definite and clear, the bidder may make written inquiry regarding same to the Engineer at least five (5) days before the scheduled closing time for filing bids. Then, if in the judgement of the Engineer, additional information or interpretation is necessary, such information will be supplied in the form of an addendum which will be delivered to all individuals, firms and corporations who have taken out Contract Documents. Such addendum shall have the same binding effect as though contained in the main body of the Contract Documents. **ORAL INSTRUCTIONS OR INFORMATION CONCERNING THE CONTRACT DOCUMENTS, OR THE PROJECT GIVEN OUT BY OFFICERS, EMPLOYEES OR AGENTS OF THE OWNER TO PROSPECTIVE BIDDERS SHALL NOT BIND THE OWNER.**

### **8. ADDENDA TO CONTRACT DOCUMENTS**

Any addendum or addenda issued by the Engineer which may include changes, corrections, additions, interpretations or information, and issued before the scheduled closing time for filing bids, shall be binding upon the bidder. The Owner shall send copies of such addenda to all contractors who have obtained copies of the Contract Documents for the purpose of bidding thereon, but failure of the Contractor to receive or obtain such addenda shall not excuse him from compliance therewith, if he is awarded the Contract.

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### 9. FAMILIARITY WITH LAWS AND ORDINANCES

The bidder is assumed to be familiar with all Federal, State and local laws, ordinances, and regulations which in any manner affect those engaged or employed in the work or the materials or equipment used in the proposed construction, or which in any way affect the conduct of the work, and no plea of misunderstanding will be considered on account of ignorance thereof. If the bidder, or Contractor shall discover any provision in the Contract Documents which is contrary to or inconsistent with any law, ordinance, or regulation, he shall forthwith report it to the owner in writing.

### 10. AMOUNT OF WORK TO BE DONE

The Owner reserves the right to increase or decrease the amount of any class or portion of the work. No such change in the work shall be considered as a waiver of any condition of the contract nor shall such change invalidate any of the provisions thereof.

The estimate of quantities of work to be done under unit price bids is approximate and is given only as a basis of calculation for comparison of bids and award of the contract. The Owner does not by implication agree that the actual amount of work will correspond precisely to the amount as shown or estimated.

The scheduled quantities of work to be done and materials to be furnished may each be increased, decreased, or omitted. Payment will be made at unit prices under the contract only for the work performed or materials furnished.

### 11. BID PRICES TO COVER ENTIRE WORK

Bidders must include in their bid prices the entire cost of each item of work set forth in the proposal, and it is understood and agreed that there is included in each lump sum or unit price bid the entire cost of materials and labor incidental or necessary to the completion of that portion of the work covered, unless such incidental work is expressly included in other lump sum or unit price bids in the proposal.

### 12. REJECTION OF PROPOSALS

The owner reserves the right to reject all bids and waive irregularities.

### 13. DISQUALIFICATION OF BIDDERS

Bidders may disqualify for reasons as outlined under the provisions of OAR 137-030-

0110

## **GENERAL CONDITIONS**

### **14. MATERIAL GUARANTY**

The successful bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the construction of the work together with samples. These samples may be subjected to the tests required elsewhere in these specifications to determine their quality and fitness for the work.

### **15. PREFERENCE FOR OREGON GOODS AND SERVICES**

The bidder shall give preference to goods or services that have been manufactured or produced in Oregon if price, fitness, availability and quality are otherwise equal.

These provisions do not apply to contracts on projects financed wholly or in part by federal funds.

### **16. CONSIDERATION OF BIDS, AWARDS AND CONTRACT**

After the proposals have been opened and read, they will be compared on the basis of total amounts. The right is reserved to reject any or all proposals, to waive technicalities and, with the consent of the bidder, to correct patent errors; if in the judgement of the City the best interest of the City will be served or promoted thereby. The results of the comparisons and considerations will be made available to the public within a reasonable time after opening of the proposals.

Award of contracts, return of proposal guaranties, execution of the contract and other provisions concerning the contract are set forth in Section C. Bidders shall familiarize themselves with Section C before submitting their proposals.

C. AWARD AND EXECUTION OF CONTRACT

1. AWARD OF CONTRACT

The award will be made by the owner to the bidder submitting the lowest acceptable bid. In determining the lowest acceptable bid, the owner may take into account, among other factors: the prices bid, the realistic balance of prices in the proposals for various parts of units of the work, and the experience and ability of the bidder to perform the work.

While price extensions are required as a matter of convenience, in the event of error in extensions the unit prices bid shall govern. In the event of discrepancy between the written and numerical amounts, the written prices will govern.

Determination of the lowest responsible bidder and award may be subject to review and determination by the owner's attorney as to legal sufficiency of any bid submitted.

The award of contract, if it be awarded, shall be made within thirty (30) calendar days after the date of opening of bids.

2. EXECUTION OF CONTRACT

Within ten (10) days after the date the bidder receives notification of award of contract as evidenced by receipt from the owner of properly prepared contract documents, the bidder to whom award is made shall execute and return the contract in the required number of copies and shall execute and furnish the performance bond bound herewith and other required bonds and insurance satisfactory to the owner.

3. FAILURE TO EXECUTE CONTRACT

Failure on the part of the bidder to whom the contract is awarded to execute the contract and to deliver the contract and required performance bond as described herein, shall be just cause for cancellation of the award, withdrawal of the contract and forfeiture of the proposal guaranty. The forfeited proposal guaranty shall become the property of the owner. Award may then be made to the next lowest acceptable bidder, or the work may be re-advertised, or it may be constructed under contract or otherwise, as the owner may decide.

4. RETURN OF PROPOSAL GUARANTY

Upon the execution of the contract and bond by the successful bidder, his proposal guaranty shall be returned to him. The bidder who has a contract awarded to him and who fails promptly and properly to execute the contract or bond shall forfeit the proposal guaranty that accompanied his bid. The proposal guaranty shall be taken and considered as liquidated damages and not as a penalty for failure of the bidder to execute the contract and bond. The proposal guaranty of unsuccessful bidders will be returned after the bids have been opened and the contract has been awarded and shall not be retained after the contract has been duly signed. The owner reserves the right to retain the bid security of the three (3) lowest bidders until the awarded contract has been signed and returned.

## GENERAL CONDITIONS

### 5. ASSIGNMENTS

Neither the contract nor any interest therein shall be transferred to any other party or parties without the prior written consent of the owner. In case of such attempted transfer without permission, the owner may refuse to carry out the contract either with the transfer or the transferee, but all rights of action for any breach of the contract by said Contractor are reserved to the owner. No officer of said owner nor any person employed in its service, is or shall be permitted any share or part of the contract or is or shall be entitled to any benefit which may arise therefrom.

### 6. PERFORMANCE AND PAYMENT BOND

The successful Bidder shall execute and furnish with the owner, at the time of execution of the contract, the Performance and Payment Bond bound herewith. The surety company furnishing this bond shall have a sound financial standing and a record of service satisfactory to the owner and shall be authorized to do business in the State of Oregon.

The Attorney in Fact (Resident Agent) who executes this Bond in behalf of the Surety company, must attach a copy of his power-of-attorney as evidence of his authority. A notary shall acknowledge the power as of the date of the execution of the surety bond which it covers.

### 7. OWNER'S IMMUNITY FROM LIABILITY

The Contractor shall save, keep and hold harmless, the owner, the Engineer and his consultants, and all employees, officers and agents thereof from all damages, costs or expenses in law or equity that may at any time arise or be set up because of damages to property or of personal injury received either by reason of or in the course performing said work which may be occasioned by any negligent act or omission to act which amounts to negligence upon the part of the Contractor or any of said Contractor's employees, or any subcontractor performing any of the work.

The owner shall not be liable or responsible for any accident, loss or damage happening to the work referred to in the contract prior to completion and acceptance thereof.

### 8. PROOF OF CARRIAGE OF INSURANCE

Work shall not commence until all insurance required in the contract has been obtained nor until such insurance has been approved by the owner, nor shall any subcontractor commence work until he also has first obtained insurance applicable to such work. The Contractor shall maintain insurance throughout the life of the contract which will hold the owner harmless and shall indemnify the owner for any and all losses to third persons or to the owner arising out of the operations, including any contingent liability arising therefrom.

### 9. CERTIFICATES OF COMPLIANCE

Prior to the acceptance of the work, the Contractor shall complete a certificate form obtained from the Engineer which substantially states the following: "I(We) hereby certify that all

## GENERAL CONDITIONS

work has been performed and materials supplied in accordance with the Contract Documents for the above work, and that: (1) Not less than the prevailing rates of wages has been paid to laborers, workers and mechanics employed on this work; (2) There have been no unauthorized substitutions of subcontractors; nor have any subcontracts been entered into without the names of the subcontractors having been submitted to the Engineer prior to the start of such subcontracted work; (3) No subcontract was assigned or transferred or performed by any subcontractor other than the original subcontractor, without prior notice having been submitted to the Engineer together with the names of all subcontractors; (4) All claims for material and labor and other service performed in connection with these specifications have been paid; (5) All monies due the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund (ORS 279.510), the State Tax Commission (ORS 315.575, 316.575 or 316.711 and 316.714), hospital associations and/or others, (ORS 279.320), have been paid."

D. SCOPE OF WORK

1. INTENT OF CONTRACT

The intent of the contract is to provide for the construction and completion of the work described. The Contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the plans, specifications and terms of the contract.

The Contractor shall perform all work in accordance with the lines, grades, typical cross sections, dimensions and other data shown on the plans or as modified by written orders of the Engineer, and all other work determined by the Engineer as necessary to proper prosecution and completion of the project.

2. PLANS AND SPECIFICATIONS

The plans, specifications and other contract documents will govern the work. The contract documents are intended to be complementary and cooperative and to describe and provide for a complete project. Anything in the specifications and not on the plans, or on the plans and not in the specifications, shall be as though shown or mentioned in both. Reference specifications and standard plans are a part of the contract documents.

While it is believed that much of the information pertaining to conditions which may affect the cost of the proposed work will be shown on the plans or indicated in the specifications, the owner does not warrant the completeness or accuracy of such information. It is the Contractor's responsibility to ascertain the existence of any conditions affecting the cost of the work which would have been disclosed by reasonable examination of the site.

The Contractor shall, upon discovering any error or omission in the plans or specifications, immediately call it to the attention of the Engineer.

3. PRECEDENCE OF CONTRACT DOCUMENTS

If there is a conflict between contract documents, the document highest in precedence shall control. The precedence shall be:

First: Permits from other agencies as may be required by law. Second: Special provisions. Third: Plans. Fourth: Standard plans. Fifth: Standard specifications. Sixth: Reference specifications.

Change orders, supplemental agreements and approved revisions to plans and specifications will take precedence over documents listed above. Detailed plans shall have precedence over general plans.

4. SHOP DRAWINGS

When shop drawings or other drawings are required by the Engineer, they shall be prepared in accordance with current modern engineering practice and at the Contractor's expense. Drawings shall be of a size and scale to show clearly all necessary details and shall be transmitted

## GENERAL CONDITIONS

by letter to the Engineer for approval or correction before commencing the work.

Materials shall not be furnished or fabricated nor any work done for which drawings are required, before approval of the drawings.

Approval of drawings by the Engineer shall not relieve the Contractor from the responsibility for errors or omissions in the drawings or from deviations from the contract documents unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal submitted with the drawings. The Contractor shall be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by use of such drawings.

### 5. CHANGES IN WORK

#### a. Changes Requested by the Contractor

Changes in specified methods of construction may be made at the Contractor's request when approved in writing by the Engineer.

Changes in the plans and specifications, requested in writing by the Contractor, which do not materially affect the work, and which are not detrimental to the work or to the interests of the owner, may be granted by the Engineer. Payment to be made per section J of these conditions.

#### b. Changes Initiated by the Owner

The owner may change the plans, specifications, character of the work, or quantity of work, provided the total arithmetic dollar value of all such changes, both additive and deductive, does not exceed 25% of the contract price. Should it become necessary to exceed this limitation, the change shall be by written supplemental agreement between the Contractor and owner.

Change orders shall be in writing and state the dollar value of the change or establish method of payment, any adjustments in contract time and, when negotiated prices are involved, shall provide for the Contractor's signature indicating acceptance.

Payment for all work to be made per section J of these conditions.

### 6. CHANGED CONDITIONS

The Contractor shall notify the Engineer in writing of the following work site conditions, hereinafter called changed conditions, promptly upon their discovery and before they are disturbed:

(a) Subsurface or latent physical conditions differing materially from those represented in the contract; and

(b) Unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character being performed.

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The Engineer will promptly investigate conditions of which notified, or any conditions discovered by the Engineer which appear to be changed conditions. If it is determined that the conditions are changed conditions and that they will materially increase or decrease the costs of any portion of the work, a change order will be issued by the Engineer adjusting the compensation for such portion of the work. If the Engineer determines that conditions of which notified by the Contractor do not justify an adjustment in compensation, the Contractor will be so advised in writing. Should the Contractor disagree with such determination, a notice of potential claim may be submitted to the Engineer.

### 7. DISPUTED WORK

If unable to reach agreement under any of the foregoing procedures, the owner may direct the Contractor to proceed with the work. Payment shall be as later determined by arbitration under Section J-12.

Although not to be construed as proceeding under extra work provisions, the Contractor shall keep and furnish records of all disputed work.

### 8. RECORDS

The Contractor shall maintain records in such a manner as to provide a clear distinction between the direct cost of extra work paid for on the force account basis and the costs of other operations performed in connection with the contract.

The Contractor shall furnish to the Engineer daily reports in duplicate of the extra work to be paid for on a force account basis. The reports shall itemize the materials used and shall set forth the direct cost of labor and the charges for equipment rental whether furnished by the Contractor, or subcontractor. The reports shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked together with the size, type and identification number of equipment and hours of equipment operation.

Material charges shall be submitted by vendors' invoices. Such invoices shall be submitted with the reports; or, if not available, they shall be submitted with subsequent reports. In the event said vendors' invoices are not submitted within 15 days after acceptance of the work, the contracting agency reserves the right to establish the cost of such materials at the lowest current price at which said materials are available in the appropriate quantities delivered to the location of the work.

All reports shall be signed by the Contractor or an authorized representative.

The Engineer will compare records with the reports furnished by the Contractor, make any necessary adjustments and then compile the costs of extra work paid for on a force account basis on forms furnished by the contracting agency. When these extra work reports are agreed upon and signed by both parties, they shall become the basis of payment for the work performed.

9. EXTRA WORK

a. General

New or unforeseen work will be classed as "extra work" when the Engineer determines that it is not covered by contract unit prices or stipulated unit prices and the character of such work is substantially different from that on which the Contractor bid. The Contractor shall not undertake any extra work unless authorized in writing by the owner or Engineer.

b. Payment

Payment for extra work will be established by agreement between the Contractor and the owner. If no agreement can be reached, payment will be made on the following basis:

The Contractor shall maintain records sufficient to distinguish the direct cost of extra work from the cost of other operations.

The Contractor shall furnish daily reports of extra work. The reports shall itemize all costs for labor, materials, and equipment rental. The reports shall include for workers hours worked, rates of pay, names and classifications; and for equipment, shall include size, type, identification number and hours of operation. All records and reports shall be made immediately available to the Engineer upon request.

All reports shall be signed by the Contractor or an authorized representative.

The Engineer's records will be compared with the Contractor's reports, and the necessary adjustments and compilation of the costs of extra work will be made. When extra work reports are agreed upon and signed by both parties, they shall become the basis of payment.

i. Labor

Labor costs shall be based on the prevailing wage scale for each craft or type of worker. Employer payments for payroll taxes and insurance, health and welfare, pension, vacation and other direct labor costs shall be included.

ii. Materials

The cost of materials incorporated in the work will be the cost to the purchaser, whether Contractor, subcontractor or other sources, from the supplier thereof, except as follows: (a) if materials are procured by the purchaser by any method which is not a direct purchase from a direct billing by the actual supplier to such purchaser, the cost of such materials shall be deemed to be the price paid the actual supplier as determined by the Engineer. No markup except for actual costs incurred in the handling of such materials will be permitted. (b) If the materials are obtained from a supplier or source owned wholly or in part by the purchaser, payment therefor will not exceed the price paid by the purchaser for similar materials furnished from said source on contract items or the current price of such materials delivered to the job site, whichever price is lower. (c) The owner reserves the right to furnish such materials as it deems advisable, and the Contractor shall have no claims for costs and profit on such furnished materials.

## GENERAL CONDITIONS

### iii. Equipment Rental

The Contractor will be paid for the use of equipment on the basis of, but not exceeding the prevailing hourly rental rates established by the Oregon State Highway Division and recognized by the Associated General Contractors for the area where such equipment is required to be operated.

On any equipment for which no rental rate has been established by the Oregon State Highway Division, or where the required operation of the equipment is less than four hours or in excess of one-week, rental rates shall be proposed by the Contractor and agreed upon in writing by the Engineer prior to the start of force account work.

Equipment that is in operational condition and is standing by with the Engineer's approval for participation in force account work, will be paid for at 50 percent of the agreed upon rental rate.

Rental time will not be allowed while equipment is inoperative due to breakdowns for periods in excess of 30 minutes. Rental time shall be computed in 1/2-hour increments. In computing rental time of equipment in actual operation, less than 30 minutes will be considered 1/2 hour.

The rental rates paid, as above provided, shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repair and maintenance of any kind, depreciation, storage, insurance and all incidentals.

All equipment shall, in the opinion of the Engineer, be in good working condition and suitable for the purpose for which the equipment is to be used.

Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

Individual pieces of equipment or tools having a replacement value of \$50.00 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefor.

The rental time to be paid for equipment on the work shall be the time the equipment is in operation on the extra work and return it to the original location, except that moving time will not be paid for if the equipment is used at the site of the extra work on other than such extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made if the equipment is used at the site of the extra work on other than such extra work.

The rental period shall begin at the time the equipment is unloaded at the site of the extra work, shall include each day that the equipment is at the site of the extra work, excluding Saturdays and legal holidays unless the extra work is performed on such days, and shall terminate at the end of the day on which the Engineer directs the Contractor to discontinue the use of such equipment. The maximum rental time to be paid per day will not exceed eight hours unless the equipment is in operation for a longer time.

E. CONTROL OF WORK

1. AUTHORITY OF THE ENGINEER

Subject to such authority as is delegated by the owner, the Engineer will decide all questions which may arise as to the quantity, quality and acceptability of materials furnished and work performed, the rate of progress of the work; change orders and time extensions; interpretation of the plans and specifications; the measurement of all quantities; the acceptable fulfillment of the contract on the part of the Contractor. The Engineer's estimates and decisions in these matters shall be final, binding and conclusive upon all parties to the contract.

It is further understood that all work to be done under the contract will not be considered completed until it has passed final inspection by the Engineer and is accepted by the owner. It is further understood that the authority of the Engineer is such that the Contractor shall at all times carry out and fulfill the instructions and directions of the Engineer insofar as they concern the work to be done under the contract.

Upon failure on the part of the Contractor to comply with any order made under the provisions of this subsection, the Engineer shall have the authority to cause unacceptable work to be remedied or removed and replaced, and unauthorized work to be removed, and to deduct the costs thereof from any monies due or to become due the Contractor.

The Engineer has the authority to suspend the work for cause as set forth in section H, particularly subsection H-5.

Approval by the Engineer signifies favorable opinion and qualified consent; it does not carry with it certification, nor assurance of completeness nor assurance of quality nor assurance of accuracy concerning details, dimensions and quantities. Such approval will not relieve the Contractor from responsibility for errors, for improper fabrication, for nonconformance to requirements or for deficiencies within his control.

2. AUTHORITY AND DUTIES OF INSPECTORS

The Engineer may appoint assistants to inspect all materials used and all work done. Such inspection may extend to any or all parts of the work and to the preparation or manufacture of the materials to be used. The inspectors will not be authorized to revoke, alter, enlarge or relax the provisions of these specifications. An inspector is placed on the work to set the necessary lines and grades and to keep the Engineer informed as to the progress of the work and the manner in which it is being done; also to call the attention of the Contractor to any infringements upon plans or specifications, but failure of the inspector or the Engineer to call the attention of the Contractor to faulty work or infringements upon the plans or specifications shall not constitute acceptance of said work.

An inspector will not be authorized to approve or accept any portion of the work or to issue instructions contrary to the plans and specifications. The inspector will have authority to reject defective material and to suspend any work that is being improperly done, subject to the

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final decision of the Engineer. The inspector will exercise such additional authority as may, from time to time, be especially delegated to him by the Engineer.

### 3. DISPUTED WORK

If the Contractor considers any work demanded of him to be outside the scope of the contract or considers any ruling of the Engineer to be unfair, upon such work being demanded or such ruling being made, the Contractor shall proceed without delay to perform the work or to conform to the ruling. The Contractor shall within ten days after date of receipt of the instructions or ruling, file a written protest with the Engineer, stating clearly and in detail the basis of objection, and include an itemized statement of any extra costs which may have resulted. Except for such protests or objections as are made of record in the manner herein specified and within the time limit stated, the records, rulings, instructions or decisions of the Engineer will be final and conclusive.

### 4. RESPONSIBILITY OF THE CONTRACTOR

The Contractor shall do all the work and furnish all labor, materials, equipment, tools and machines necessary for the performance and completion of the project in accordance with the contract documents within the specified time.

Material and construction details of plants, forms, shoring, falsework and other structures built by the Contractor but not a part of the permanent project shall meet the approval of the Engineer, but such approval shall not relieve the Contractor from responsibility for their safety and sufficiency.

The Contractor shall be responsible for all expense involved in making any required changes in the plans or specifications to accommodate a substitution approved by the Engineer for the convenience of the Contractor or to circumvent an unforeseen difficulty in obtaining a specified article.

The Contractor shall assume all responsibility for the work. As between him and the owner, the Contractor shall bear all losses and damages directly or indirectly resulting to him, to the owner or to others on account of the character of performance of the work, unforeseen difficulties, accidents or any other cause whatsoever. The Contractor shall assume the defense of indemnity and save harmless the owner, its officers and employees from all claims, liability, loss, damage and injury of every kind, nature and description, directly or indirectly resulting from the Contractor's activities in the performance of the Contract, the ownership, maintenance or use of motor vehicles in connection therewith, or the acts, omissions, operations, or conduct of the Contractor or any subcontractor under the contract, or in any way arising out of the contract, irrespective of whether act, omission or conduct of the Contractor or subcontractor is merely a condition rather than a cause of the claim, liability, loss, damage or injury.

### 5. NOTIFICATIONS RELATIVE TO CONTRACTOR'S ACTIVITIES

The Contractor shall obtain prior approval from the Engineer for the closing or

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partial closing of any road, street, alley or other public thoroughfare. The Contractor shall give advance notice of such closure to all agencies providing emergency services including, but not limited to, the sheriff, police, fire and ambulance services.

The Contractor shall notify all utilities before commencing work including, but not limited to, gas, communications, power and water.

Utilities may not be located as shown or marked as the location may have been established from records and not from on-site inspection. The Contractor shall notify utilities at least two working days prior to commencing work of the date on which work will commence, in order to give the utilities a reasonable opportunity to establish the location of utilities by on-site examination prior to commencing the work. The Contractor shall adhere to the above notification requirements during the progress of the work where the work is such that location of utilities is necessary as the work progresses.

The Contractor shall notify all agencies affected by the operations so as to properly coordinate and expedite the work in such a manner as to cause the least amount of conflict and interference between such operations and those of other agencies.

Notification shall include, but not be limited to, the time of commencement and completion of work, names of streets or location of alleys to be closed, schedule of operations and routes of detours where possible.

Damages or claims resulting from improper or insufficient notification of the affected agencies shall be the responsibility of the Contractor.

### 6. UTILITIES AND EXISTING IMPROVEMENTS

Any information shown as to the location of existing water courses, drains, sewer lines or utility lines which cross or are adjacent to the project, has been compiled from the best available sources, but is not guaranteed to be accurate.

The Contractor shall provide for the flow of sewers, drains or water courses interrupted during the progress of the work and shall restore such drains or water courses as approved by the Engineer. The Contractor shall make excavations and borings ahead of work as necessary, to determine the exact location of interfering utilities or underground structures.

Ordinarily, utility companies responsible for facilities located within the right-of-way will be required to complete any installation, relocation, repair, or replacement prior to the commencement of work by the Contractor. However, when this is not feasible or practicable or the need for such work was not foreseen, such utility owners or the owner shall have the right to enter upon the right-of-way and upon any structure therein for the purpose of making new installations, changes or repairs. The Contractor shall conduct operations so as to provide the time needed for such work to be accomplished during the progress of the improvement.

The Contractor shall be responsible for all costs for the repair of damage to the contract work or to any utility, previously known or disclosed during the work, as may be caused by operations. The Contractor shall maintain in place utilities now shown on the drawing to be relocated or altered by others and shall maintain utilities which are relocated by others in their

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relocated positions in order to avoid interference with structures which cross the project work. All costs for such work shall be included in the prices bid for the various items of work.

### 7. SURVEY SERVICE

The Contractor shall give notice to the Engineer not less than two working days in advance of when survey services will be required in connection with the laying out of any portion of the work.

The owner will furnish and set construction stakes establishing lines and grades as determined necessary by the Engineer for all work under the contract, including lines and grades for street excavation and fill, finished subgrade, finished base material, curbs and gutters, walks, structures and utilities, and will furnish the Contractor all the necessary information relative to the lines and grades.

The owner will furnish appropriate offset lines and grades for all projects involving trenching operations. The Engineer will not transfer the offset lines or grades into the ditch, to batter boards, or any other point within the work which is provided by the Contractor.

### 8. PROTECTION OF SURVEY MARKERS

#### a. Permanent Survey Markers

The Contractor shall notify the Engineer not less than seven days prior to starting work in order that the Engineer may take necessary measures to insure the preservation of survey monuments, stakes and bench marks. The Contractor shall not disturb permanent survey monuments, stakes, or bench marks without the consent of the Engineer, and shall notify the Engineer and bear the expense of replacing any that may be disturbed without permission. Replacement shall be done by a registered land surveyor at no expense to the owner.

When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, the monument cover shall be adjusted to the new grade.

#### b. Lines and Grade

The Contractor shall preserve construction survey stakes and marks for the duration of their usefulness during construction. If any construction survey stakes are lost or disturbed, and in the judgement of the Engineer need to be replaced, such replacement shall be by the Engineer at no expense to the owner. The cost of replacement shall be charged against, and shall be deducted from, the payment for the work.

#### c. Lot Stakes

Unless otherwise directed by the Engineer or shown in the plans, the Contractor shall preserve existing survey stakes that mark property lines and corners. Any stakes that become lost or disturbed by his operations shall be replaced by a registered land surveyor at no expense to the owner.

9. OTHER SURVEYORS

Surveying by private land surveyors on permit projects or any other work under the control of the owner shall conform in all respects to the quality and practice required of the owner's surveyors as set forth in subsection E-7.

10. PROTECTION OF PROPERTY

The Contractor shall protect all public and private property insofar as it may be endangered by operations and take every reasonable precaution to avoid damage to such property.

The Contractor shall restore and bear the cost of any public or private improvement, facility or structure within the right-of-way which is damaged or injured directly or indirectly by or on account of any act, omission or neglect in the execution of the work and which is not designated for removal and is visibly evident or correctly shown on the plans. The Contractor shall restore to a condition substantially equivalent to that existing before such damage or injury occurred, by repairing, rebuilding or otherwise affecting restoration thereof, or if this is not feasible, make a suitable settlement with the owner of the damaged property, all at no expense to the owner.

The Contractor shall give reasonable notice to occupants of buildings on property adjacent to the work to permit the occupants to remove vehicles, trailers and other possessions as well as salvage or relocate plants, trees, fences, sprinkler systems or other improvements in the right-of-way which are designated for removal or which might be destroyed or damaged by work operations.

The Contractor shall protect all designated trees and planted areas within the right-of-way easements and shall exercise care and conduct operations so as to minimize damages to other planted areas.

The Contractor shall review with the Engineer the location, limits and methods to be used prior to clearing work. Clearing and grubbing shall be performed in strict compliance with all local, state and federal laws and requirements pertaining to clearing and burning, and particularly in conformity with the provisions of ORS 477 and all subsequent amendments which require, among other things, filing with the state forester a general description of the right-of-way to be cleared before the start of clearing operations and shall perform the clearing work in conformity with the terms of the permit issued by the state forester.

11. TEMPORARY TRAFFIC CONTROL

The contractor shall provide and be responsible at all times for such flagmen, signs and other devices not otherwise specified to be furnished by the owner. The Contractor shall erect and maintain all barricades, guards, standard construction signs, warning signs and detour signs, as are necessary to warn and protect the public at all times from injury or damage as a result of the work operations on highways, roads or streets affected by such operations.

Upon failure to immediately provide the necessary flagmen or to provide, erect, maintain and remove barricades, lights and standard signs when so ordered, the Engineer shall be at liberty, without further notice to the Contractor or the Contractor's surety, to do so and deduct all of

the costs thereof from any payments due or coming due the Contractor.

Refer to TEMPORARY PROTECTION AND DIRECTIONAL MEASURES FOR TRAFFIC for additional requirements in Section II of Standard Specifications.

12. PROTECTION OF WORK

Until acceptance of the project, the Contractor shall at all times protect from damage all public property and private property which may be affected by the work and preserve all materials, supplies, equipment of any description, and all work already performed, from the nature of the work, the action of the elements, and damage by any person or persons or from any other cause whatsoever.

13. MAINTENANCE OF WORK AFTER ACCEPTANCE

Upon the request of the Contractor and with the approval of the Engineer, or upon the order of the Engineer, the Contractor will be relieved of the duty of maintaining and protecting certain portions of the work which are approved to be placed in service and which have been completed in accordance with the contract documents.

In addition, such action by the Engineer will relieve the Contractor of responsibility for injury or damage to said completed portions of the work resulting from use by public traffic or from the action of the elements or from any other cause, excepting injury or damage resulting from the Contractor's own operations or negligence. The Contractor will not be required to again clean up such portions of the improvement prior to field acceptance, excepting for such items of work as result from the Contractor's operations. However, nothing in this section shall be construed as relieving the Contractor from full responsibility for making good work or materials found to be defective.

14. USE OF LIGHT, POWER AND WATER

The Contractor shall furnish temporary light, power and water complete with connecting piping, wiring, lamps and similar equipment necessary for the work as approved. The Contractor shall install, maintain and remove temporary lines upon completion of work. The Contractor shall obtain all permits and bear all costs in connection with temporary services and facilities at no expense to the owner.

15. SUBSURFACE DATA

All information obtained by the Engineer regarding subsurface information and groundwater elevations will be available for inspection at the office of the Engineer upon request. Known utilities and structures expected to be adjacent to or encountered in the work are shown on the plans. Such information is offered as supplementary information only. Neither the Engineer nor the owner assumes any responsibility for the completeness or interpretation of such supplementary information.

Logs of test holes, test pits, soils reports, groundwater levels and other

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supplementary subsurface information are offered as the best available information of underlying materials and conditions at the locations actually tested. The owner will not be liable for any loss sustained by the Contractor as a result of any variance between conditions contained in or interpretations of test reports and the actual conditions encountered during progress of the work.

The Contractor shall examine the site and available records, as set forth in subsection B-6. The submission of a proposal shall be conclusive evidence that the bidder has investigated and is satisfied as to the subsurface conditions to be encountered, as to the character, quality and quantities of work to be performed and materials to be furnished and as to the requirements of the contract documents.

The Contractor shall contact all utility companies as to underground utilities in the area of work as set forth in Section E-5. Relocation of underground utilities which lie within the construction area or trench width necessary to complete the work shall be the responsibility of the owner. Damage to existing utilities shall be the responsibility of the Contractor.

### 16. VERBAL AGREEMENTS

No verbal agreement or conversation with any officer, agent or employee of the owner, either before or after execution of the contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the contract. Any such verbal agreement or conversation shall be considered as unofficial information and in no way binding upon the owner.

### 17. DUST CONTROL

During all phases of the construction work, and when directed, the Contractor shall take precautions to abate dust nuisance by cleaning up, sweeping, sprinkling with water, or other means as necessary to accomplish the suppression of dust.

### 18. REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

All work which does not conform to the requirements of the contract shall be considered as unacceptable.

The Contractor shall remove all unacceptable and defective work. The Contractor shall perform replacement by work and materials which conform to the contract documents, or remedy otherwise in an approved manner. The provision shall have full effect regardless of the fact that the unacceptable work may have been done or if the defective materials were used with the full knowledge of the inspector. The fact that the inspector in charge may have previously overlooked such defective work shall not constitute an acceptance of any part of such work.

The Contractor shall do no work without lines and grades having been given by the Engineer. Work done contrary to or regardless of the instructions of the Engineer, work done beyond the lines shown or as directed, except as herein provided, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the

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contract. Work so done may be ordered removed or replaced at no expense to the owner.

In the event any defect in work is of a minor nature and the Engineer determines that it is not of such consequence as to result in a dangerous or undesirable condition, the owner shall have the right to retain such work and make such deductions in the payment therefore as determined reasonable and in the public interest. Such determination by the owner shall be final.

### 19. CLEANUP

From time to time as the work progresses and immediately after completion of the work, the Contractor shall clean up and remove all refuse and unused materials of any kind resulting from the work. Upon failure to do so within twenty-four hours after directed, the work may be done by the owner and the cost thereof be deducted from any payment due the Contractor.

After all other work embraced in the contract is completed and before final acceptance of the contract, the entire right-of-way and easement area including the roadbed, planting, sidewalk, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections shown and as specified.

As a condition precedent to final acceptance of the project, the Contractor shall remove all equipment and temporary structures, and all rubbish, waste and generally clean up the right-of-way and premises to conform substantially to conditions as they existed before the commencement of work.

### 20. FINAL INSPECTION

At such time as all construction work on the project is complete and all extra work bills, forms and documents required under the contract are submitted, the Contractor shall so notify the Engineer in writing. The Engineer will make an inspection of the project and project records within fifteen days of receiving said notice. If, at such inspection, all construction provided for and ordered under the contract is found completed and satisfactory and all certificates, bills, forms and documents have been properly submitted, such inspection shall constitute the final inspection.

If any work in whole or in part is found unsatisfactory, or it is found that all certificates, bills, forms and documents have not been properly submitted, the Engineer will give the Contractor the necessary instructions as to replacement of material and performance or reperformance of construction work necessary and prerequisite to satisfactory final completion of construction work and will give the Contractor the necessary instructions for submission of bills, forms and documents, and the Contractor forthwith shall comply with and execute such instructions. At such time as such instructions are complied with and executed, the Contractor shall so notify the Engineer in writing. The Engineer will make another inspection within fifteen days after such notice and this inspection shall constitute the final inspection, if all requirements of the instructions have been met to the satisfaction of the Engineer. If the instructions are not completed to the satisfaction of the Engineer, additional instructions will be issued by the Engineer and the process will be repeated until the Engineer is satisfied all requirements are complied with. The

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inspection, when the Engineer is satisfied all requirements have been met, will be considered the final inspection.

F. CONTROL OF MATERIALS

1. PREFERENCE FOR USE OF OREGON PRODUCTS

Preference may be given to articles or materials produced or manufactured in Oregon. These provisions do not apply to contracts on projects financed wholly or in part by federal funds.

2. QUALITY OF MATERIALS

The Contractor shall use only new materials, parts, products and equipment in the work which conform to the specified requirements. The Contractor shall determine the kind of work, amount of work and other factors that may be necessary or involved in furnishing the specified products and materials. Materials and products which, after approval, have become unsuitable or unacceptable for use, regardless of cause, will be rejected by the Engineer and shall not be used.

3. SAMPLING AND TESTING

Tests of materials will be made by the Owner in accordance with the methods described or designated in the applicable specifications, and at any time during the production, fabrication, preparation and use of the materials.

The Owner reserves the right to require samples and to test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer thereof as set forth in Section F-4.

When tests of materials are necessary, as determined by the Engineer, such tests will be made by, and at the expense of, the Owner unless otherwise specified. The Contractor shall afford such facilities as required for collecting and forwarding samples where practical and withhold from use the materials represented by the samples until tests have been made and the materials found equal to the requirements of the specifications or to approved samples. In all cases, the Contractor shall furnish and make available the required samples without charge. Samples shall be made available in ample time to permit testing of the materials prior to use, and no claim will be allowed for any delay caused by awaiting test results. To facilitate and make safe the sampling of materials at plants, the Contractor shall provide safety measures and devices to protect those who take the samples.

In the absence of any reference specification, it shall be understood that such materials shall meet the specifications and requirements of the American Society for Testing and Materials (ASTM). When there is no pertinent coverage under ASTM, the material concerned shall meet specifications and requirements of applicable commercial standards of the Commodity Standards Division of the U.S. Department of Commerce. Lacking such coverage, the materials

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shall meet requirements established by reputable industry for a high-quality product of the kind involved.

All testing shall be performed by or handled through the testing laboratory of the Owner or as directed by the Engineer.

In the event the Owner requests tests and materials fail, the Contractor shall bear all costs for all subsequent testing necessary to meet the specified requirements.

### 4. CERTIFICATION

For commercial products inclusive of industry standardized products, in lieu of normal sampling and testing procedures by the Contractor and the Owner, the Engineer may accept from the Contractor the manufacturer's certification with respect to the product involved, under the conditions set forth as follows:

a. The certification shall state that the named product conforms to the Owner's requirements and the representative samples thereof have been sampled and tested as specified.

b. The certification shall either be accompanied with a certified copy of the test results or certify that such test results are on file with the manufacturer and will be furnished to the Engineer upon request.

c. The certification shall give the name and address of the manufacturer and the testing agency and the date of tests; and shall set forth the means of identification which will permit field determination of the product delivered to the project as being the product covered by the certification.

d. The certification shall be in duplicate with one copy to be sent with the shipment of the covered product to the Engineer, and with one copy sent to the Owner.

e. The Owner will not be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.

### 5. INSPECTION REQUIREMENTS

The Contractor shall allow access by the Engineer's representatives to all parts of the work and to the plants of producers and fabricators at all times and will furnish them with every reasonable facility for ascertaining whether or not the work is in accordance with the requirements and intent of the Contract Documents. The Contractor shall furnish such samples as are customarily

required for testing purposes at no expense to the Owner.

6. INSPECTION BY OTHERS

Inspection of the work by persons other than representatives of the Owner will not constitute inspection by the Owner, except as set forth in section F-4.

7. STORAGE AND PROTECTION OF MATERIALS

Materials shall be stored so as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the right-of-way may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefor shall be provided by the Contractor at his expense. The Contractor shall not use private property for storage purposes without written permission of the property owner or lessee. When requested, the Contractor shall furnish copies of such written permission to the Engineer.

8. TRADE NAMES, APPROVED EQUALS OR SUBSTITUTIONS

In order to establish a basis of quality, certain processes, types or machinery and equipment, or kinds of materials may be specified either by description or process or by designating a manufacturer by name and referring to that brand or product designation, or by specifying a kind of material. It is not the intent of the specifications to exclude other processes, equipment or materials of equal value, utility or merit.

Whenever a process is designated, or a manufacturer's name, brand or item designation is given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether in fact they do so or not.

If it is desirable to furnish items of equipment by manufacturers other than those specified, as a substitute after the Contract is executed, the Contractor shall secure approval prior to placing a purchase order or furnishing the same.

If the proposal includes a list of equipment, materials, or articles for which the Contractor must name the manufacturer at the time of submission of the bid, no substitutions therefore will be permitted after a proposal has been accepted without the express consent of the Owner.

9. OWNER FURNISHED MATERIALS

Any material furnished by the Owner will be delivered or made available to the Contractor at the locations specified or shown. The cost of handling and placing such materials after they are delivered to the Contractor will be considered as included in the contract price for the item in connection with which they are used. The Contractor will be held responsible for all material delivered to the Contractor by the Owner and deductions will be made from any monies due to make good any shortages, deficiencies, and damages which may occur after such delivery, and for any demurrage charges.

G. LEGAL RELATIONS AND RESPONSIBILITIES

1. PERFORMANCE AND PAYMENT BOND

The Contractor shall provide and maintain performance and payment bond as set forth in subsection C-6.

2. LAWS AND REGULATIONS

The Contractor shall keep fully informed of all federal, state and local laws, ordinances and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affects the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders and decrees. The Contractor shall protect and indemnify the owner and his representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by the Contractor, his subcontractors, suppliers of materials or services, or others engaged by the Contractor of the employees of any of them.

The Contractor's attention is directed to the statutes of the State of Oregon for public works contracts. Section 279 of the Oregon Revised Statutes, as amended or superseded, including the latest additions and revisions, are incorporated by reference as a part of the contract documents.

In conformance with the requirements of ORS 279.318, the owner shall make specific reference to federal, state and local agencies that have enacted ordinances or regulations dealing with the prevention of environmental pollution and the preservation of natural resources that affect the performance of the contract. If the successful bidder is delayed or must undertake additional work by reason of existing regulations or ordinances of agencies not cited in the public contract or due to the enactment of new or the amendment of existing statutes, ordinances or regulations relating to the prevention of environmental pollution and the preservation of natural resources occurring after the submission of the successful bid, the awarding agency shall grant a time extension and issue a change order setting for the additional work that must be undertaken. The change order shall not invalidate the contract and there shall be, in addition to a reasonable extension of contract time, a reasonable adjustment in the contract price to compensate the successful bidder for all costs and expenses incurred, including overhead and profits, as a result of such delay or additional work.

Federal and state agencies normally having a responsibility relating to the environment include, but are not limited to, the following:

- U.S. Environmental Protection Agency
- U.S. Corps of Engineer
- U.S. Coast Guard
- Oregon Department of Environmental Quality
- Oregon Division of State Lands
- Oregon Department of Mining and Mineral Industries

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### 3. ASSIGNMENT OF CONTRACT AND SUBLETTING

No contract or any portion thereof may be assigned or sublet without consent of the owner except that money due the Contractor may be assigned as specified below.

The Contractor may assign money due or to become due him under the contract and such assignment will be recognized by the owner, if given written notice thereof, to the extent permitted by law, but any assignment of money shall be subject to all proper setoffs and withholdings in favor of the owner and to all deductions provided for in the contract, and particularly all money withheld, whether assigned or not, shall be subject to being used by the owner for completion of the work in the event the Contractor should be in default therein.

### 4. SUBCONTRACTORS

No part of the work shall be transferred or subcontracted without prior written consent of the owner, or approval at the time of award, and no such consent or approval shall release the Contractor from any obligation to the owner or to persons employed by the subcontractors, or to those supplying materials to the subcontractors. In all cases, subcontractors will be considered by the owner as an employee and liable to be replaced for incompetency, neglect of duty or misconduct.

### 5. NO WAIVER OF LEGAL RIGHTS

The owner shall not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work or payment therefore, from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is untrue or incorrectly made, or that the work or materials do not conform in fact to the contract. The owner shall not be precluded or stopped, notwithstanding any such measurement, estimate or certificate, or payment in accordance therewith, from recovering from the Contractor and the Contractor's sureties such damages as may be sustained by reason of failure to comply with the terms of the contract, or from enforcing compliance with the contract. Neither the acceptance by the owner, nor any payment for all or any part of the project, shall operate as a waiver of any portion of the contract or of any power herein reserved, or any right to damages herein provided. A waiver of any breach of the contract shall not be held to be a waiver of any other subsequent breach.

### 6. OTHER CONTRACTS

The owner shall have the right to let other contracts be coordinated with this contract. The Contractor shall cooperate with and afford such other Contractors reasonable opportunity for introduction and storage of materials and for execution of their work. Any matter of dispute shall be decided by the Engineer, and that decision shall be binding. If any part of the work depends for its proper execution upon the work of any such other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects that affect the subsequent work. Failure to do so shall constitute an acceptance of such other Contractor's work as fit and proper for the

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reception and attachment of the Contractor's own work and equipment.

7. INSURANCE

The Contractor shall provide and maintain insurance as set forth in subsection C-8.

a. Public Liability and Property Damage Insurance

The Contractor shall maintain such public liability and property damage insurance as will protect the Contractor and the owner from any and all claims for damage or personal injury including death, which may arise from operations under this contract or in connection therewith, including all operations of subcontractors.

Such insurance shall provide coverage for not less than the following:

For Personal Injury:	\$1,000,000	Each Person
	\$2,000,000	Each Occurrence
For Property Damage:	\$1,000,000	Each Claimant
	\$2,000,000	Each Occurrence

In lieu of the foregoing, a single limit public liability policy for personal injury and property damage will be accepted in the sum of \$2,000,000.

Such insurance shall be without prejudice to coverage otherwise existing, and shall name as additional insured the owner and all other governmental bodies with jurisdiction in the area involved in this project, their officers and employees, and shall further provide that this policy shall not be terminated or be cancelled prior to the completion of this contract without 30 days written notice by certified mail to the auditor, which notice shall be subject to the approval of the attorney, said notice to commence to run from the date notice is actually received at the office of the auditor.

Notwithstanding the naming of additional insured, the said policy shall protect each insured in the same manner as though a separate policy had been issued to each; but nothing herein shall operate to increase the insurer's liability as set forth elsewhere in the policy beyond the amount or amounts for which the insurer would have been liable if only one person or interest had been named as insured.

A certificate evidencing such insurance together with the proper endorsement shall be filed with the auditor and shall be subject to the approval of the attorney as to the adequacy of protection.

b. Workers' Compensation Insurance

The Contractor shall provide worker's compensation insurance coverage for all persons employed on the work to be done under the contract and assure that all workers will receive the compensation for compensable injuries provided in ORS 656.001 to 656.794 either by:

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1. Contributing to the Industrial Accident Fund as a contributing employer; or
2. Qualifying as a direct responsibility employer under ORS 656.405 and 656.409.

In the event that the Contractor or any of the subcontractors shall elect to fulfill this responsibility by qualifying as a direct responsibility employer under ORS 656.405 and 656.409, satisfactory proof of such fact shall be required. In the event that the certification as a direct responsibility employer is withdrawn, as provided in ORS 656.417, the Contractor or any subcontractor shall thereafter on the effective date of the withdrawal of certification, become a contributing employer.

### 8. ROYALTIES AND PATENTS

The Contractor shall hold harmless and be liable for all suits brought against the owner by reason of infringement of patent rights on any material, machine or appliance that may be used on the work or incorporated into the finished job, except where specifically exempted by the special provision. Unit prices names in the proposal shall include payment of royalties, if any.

### 9. PERMITS, LICENSES AND TAXES

The Contractor shall procure all permits and licenses, pay all charges, fees and taxes and give all notices necessary and incidental to the due and lawful prosecution of the work except that the owner will obtain and pay for the following:

- a. All permits required by the Coast Guard for crossing navigable streams.
- b. All permits required by the Corps of Engineers for encroachments on navigable streams where such encroachments are called for by the plans for the project.
- c. All permits required by the Division of State Lands for removal of materials from or depositing materials in waterways where such work is specifically required by the Division of State Lands for operations in any owner-controlled source of materials listed in the special provisions.
- d. All permits required by the State Department of Geology and Mineral Industries for operations in any owner-controlled source of materials or any disposal area listed in the special provisions.
- e. All permits required from local agencies for construction of buildings where such work is required by the plans for the project.

The Contractor's attention is directed to ORS 274.530 relating to "lease of stream beds" by Division of State Lands.

The Contractor shall comply fully with ORS 477.685 which reads, in part, as

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follows:

"(1) Before clearing any right of way for any highway or railroad, or any power, commercial telegraph or telephone line, or for any transmission utility right of way on any forest land, whether upon his land or that of another, where clearing would constitute a fire hazard, every person shall file with the forester a general description of the right of way to be cleared. The forester shall issue a written permit for such clearing. The permit shall set forth the precautionary conditions and manner under which the clearing shall be done.

(2) Subsection (1) of this section does not apply to railroad spurs or temporary roads not exceeding one-half mile in length, or to forest land for which an operation permit is in effect.

(3) A person engaged in clearing any right of way on forest land shall not place on adjoining land or property any forest material or debris resulting from such clearing without the permission of the owner of the adjoining land."

### 10. WAGE RATES

The Contractor and all subcontractors shall pay employees no less than current Prevailing Wage Rates, (PWR), including fringe benefits, as determined by the Commission of Bureau of Labor and Industries, and as prescribed under the provisions of ORS 279.348 through 279.363. The Contractor and subcontractors must post the PWR which is contained in the contract specifications. Copies of the rates may be obtained from the Bureau of Labor and Industries. The rates must be posted on the job site in a conspicuous place which is accessible to employees and must remain posted for the duration of the job.

The Contractor shall submit a complete weekly payroll for the week immediately preceding the submission as follows:

(a) For projects of less than 90 days (2 times), once before the first payment is made and once before the final payment is made.

(b) For projects exceeding 90 days, once before the first payment is made; at 90-day intervals thereafter; and once before the final payment is made.

Payroll and Certified Statement forms are available at any office of the Bureau of Labor and Industries. The forms must be submitted to the City and to the Wage and Hour Division of Bureau of Labor and Industries. The payroll and certified statements must be kept by the Contractor for three (3) years.

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### 11. EMPLOYER'S CONTRACT FOR MEDICAL CARE OF EMPLOYEES

The Contractor shall make payment promptly, as due, to any person, co-partnership, association or corporation furnishing medical, surgical and hospital care, or other needed care and attention, incident to sickness or injury, to employees, of all sums which have been agreed to be paid for such services and all monies and sums which: (1) may or shall be deducted from the wages of employees for such services pursuant to the terms of Oregon Revised Statutes Chapter 655, and any contract entered into pursuant thereto; or, (2) are collected or deducted from the wages of employees pursuant to any law, contract or agreement for the purpose of providing or paying for such services.

### 12. PAYMENT OF OBLIGATIONS

The Contractor shall make promptly as due, to all persons supplying labor or materials for the prosecution of work under the contract. The Contractor shall not permit any lien or claim to be filed or prosecuted against the owner on account of any labor or material furnished. Contractor shall pay to the State Tax Commission all sums withheld from employees pursuant to Oregon Revised Statutes Chapters 315 or 316.

Failure to make prompt payment of any claim when due, for labor or services supplied for the prosecution of work under the contract, including labor or material supplied to subcontractors, may necessitate owner paying such claim to the person furnishing the labor or services and charging the amount of payment against funds due or to become due to the Contractor by reason of his contract. Such payment shall not relieve the Contractor or his surety from obligations with respect to any unpaid claims.

### 13. PROTECTION OF OTHER GOVERNMENTAL AUTHORITIES

Whenever work under the contract affects or may affect public property owned by or under the jurisdiction of any governmental authority, agency or district, including a governmental subdivision other than the owner's, the Contractor shall indemnify and save harmless such governmental authority, its officers, agents and employees from any loss, damage or claim of loss or damage to such property or the use thereof, arising from work under the contract. The Contractor shall supply any bond or insurance and make any special guarantee deposit required by such governmental authority, before beginning any portion of the work which affects or may affect the property of such governmental authority or the use thereof.

### 14. PUBLIC SAFETY AND CONVENIENCE

The Contractor shall conduct the project with proper regard for the safety and convenience of the public. When the project involves use of public ways, Contractor shall provide flagmen when directed and install and maintain means of free access to all fire hydrants, service stations, warehouses, stores, houses, garages and other property.

Private residential driveways shall be closed only with approval of the Engineer or specific permission of the property owner. The Contractor shall not interfere with normal operation

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of public transit vehicles unless otherwise authorized. The Contractor shall not obstruct or interfere with travel over any public street or sidewalk without approval. Where detours are necessary, they shall be maintained with good surface and shall be clearly marked. The Contractor shall provide open trenches and excavations with adequate barricades of an approved type which can be seen from a reasonable distance. At night, the Contractor shall mark all open work and obstructions by lights. The Contractor shall install and maintain all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges and facilities. The Contractor shall observe all safety instructions received from the Engineer or governmental authorities but following of such instructions shall not relieve the Contractor from the responsibility or liability for accidents to workers or damage or injury to person or property.

Emergency traffic such as police, fire and disaster units shall be provided reasonable access to the work area at all times.

The Contractor shall be liable for any damages which may result from failure to provide such reasonable access or failure to notify the appropriate authority.

### 15. PERSONAL SAFETY

The Contractor shall be responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal work hours. Safety provisions shall conform to the applicable federal, state, county and local law, ordinances and codes. Where any of these are in conflict, the more stringent requirement shall be followed.

The Contractor shall maintain at the office or other well-known place at the job site, all articles necessary for giving first aid to the injured and establish the procedure for the immediate removal to a hospital or a doctor's care of employees and other persons who may be injured on the job site.

The duty of the Engineer to conduct construction reviews of the Contractor's performance is not intended to include a review of the adequacy of the Contractor's safety measures in, on or near the construction site.

All accidents causing death or serious injuries or damages shall be reported immediately by telephone or messenger to both the Engineer and the owner. In addition, the Contractor shall promptly report in writing to the Engineer all accidents whatsoever arising out of or in connection with, the performance of the work, whether on or adjacent to the site, giving full details and statements of witnesses.

If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

### 16. LABOR

Upon notification in writing from the Engineer, the Contractor shall remove immediately from the job for its duration any laborer, worker, mechanic, foreperson, superintendent

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or other person employed who is found to be incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fails or refuses to perform work properly and acceptably.

Attention is directed to provisions of owner's code regarding Equal Opportunity Program and certification thereunder, and to Chapter 659, Oregon Revised Statutes relative to unlawful employment practices and discrimination by employers against any employee or applicant for employment because of race, religion, color, sex or national origin. Particular reference is made to ORS 659.030 which states that it is an unlawful employment practice for an employer, because of race, religion, color, sex or national origin of any individual to refuse to hire or employ or to bar or discharge from employment such individual or to discriminate against such individual in compensation or in terms, conditions or privileges of employment.

In the event of the Contractor's noncompliance with the non-discrimination clauses of a contract so funded, or with any such rules, regulations or orders, the contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order number 11246, and such other sanctions may be imposed and remedies invoked as provided in Executive Order number 11246, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

### 17. WORKING CONDITIONS

The Contractor agrees, pursuant to ORS Chapter 279, that no person shall be employed for more than 8 hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or where the public policy absolutely requires it, and in such cases the worker shall be paid at least time and a half for all overtime in excess of eight hours a day and for work performed on Saturday and on any legal holiday specified in ORS Chapter 187, except Veteran's Day. However, when specifically agreed to under a written labor-management negotiated labor agreement, a worker may be paid at least time and a half pay for work performed on Veteran's Day or any legal holiday specified in ORS Chapter 187. Overtime provisions may be waived within a collective bargaining agreement in accordance with ORS 279.342. This paragraph does not apply to labor performed in the manufacture or fabrication of any material ordered by the Contractor or manufactured or fabricated in any plant or place other than the place where the main contract is to be performed.

### 18. USE OF EXPLOSIVES

Any blasting or use of explosives requires the approval of the Engineer and is subject to all the provisions, laws, orders and regulations of any other governmental authority in whose jurisdiction such work may be done.

### 19. RAILROAD CROSSINGS OR RIGHT-OF-WAY

Whenever the project or work thereunder involves the crossing of any railroad line or the encroachment of any railroad right-of-way, the Contractor shall submit a program of

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proposed operations within the railroad rights-of-way area which shall be approved by the appropriate railroad officials and the Engineer before the work is started within such area. The Contractor shall pay for services of flagmen and/or watchmen furnished by the railroad company and provide drive piling, set cribbing, build bridges or tunnels, install enclosing pipe and do all other work required by the railroad company or necessary for the safety or maintenance of railroad traffic. The Contractor shall furnish any bond or insurance required of the owner by the railroad company as a result of such intended operations and indemnify the owner for any and all expenses incurred by the owner and assume any and all liability or claims thereof imposed on the owner as a result of operations in the railroad right-of-way area. The Contractor shall bear all costs resulting from interferences, obstructions or liabilities set forth in this specification, whether or not herein specifically mentioned.

### 20. RIGHT-OF-WAY AND EASEMENTS

The Contractor shall confine construction activities within property lines, limits of easements and limits of construction permits as shown or specified in the contract documents, unless arrangements are made with owner(s) of adjacent private property. Prior to the use of any private property outside these specified boundaries, the Contractor shall file with the Engineer a written permission of the property owner(s), and upon terminating such usage, file with the Engineer a release from all damages, signed by the property owner(s).

The Contractor shall not unreasonably encumber the specified work areas with materials and equipment and shall obtain and bear the cost of permits for special occupancy and the use of the specified work areas from the proper agencies. The Contractor shall comply with the Engineer's directions regarding signs, advertisements, fires and smoking.

### 21. WASTE SITES

Excavated materials not suitable or not required for backfill or embankment shall be deposited on one or both of the following waste sites: (1) predesignated waste sites contained in the contract documents, and (2) waste sites provided by the Contractor. All costs for disposing of this excess material shall be incidental to other items of work contained in the proposal.

The Contractor shall operate either type of waste site in such a manner as to meet all safety and health requirements of state and local agencies. Sites, operations or the result of such operations which create a nuisance problem, or which result in damage to public or private properties will not be permitted.

The owner will provide permits for dumping at waste sites designated in the contract documents. The Contractor will be responsible for obtaining the necessary permits for dumping at waste sites provided by the Contractor.

### 22. VERMIN CONTROL

At the time of occupancy by the owner, any structure or structures entirely constructed under the contract shall be free of rodents, insects, vermin or pests. The Contractor

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shall arrange and pay for extermination work as may be necessary as part of the contract work within the contract time. Work shall be performed by a licensed agency in accordance with the requirements of governing authorities. The Contractor shall assume responsibility for any injury to persons or property resulting from extermination work and for the elimination of any offensive odors resulting from extermination operations.

### 23. WARRANTY AND MAINTENANCE

The Contractor shall make all necessary repairs and replacements to remedy, in a manner satisfactory to the Engineer and at no cost to the owner, any and all defects, breaks, or failures of the work occurring within one (1) year following the date of acceptance of the work due to: faulty or inadequate materials or workmanship, and for damage or disturbances to other improvements under, within, or adjacent to the work, whether or not caused by settling, washing or slipping when such damage or disturbance is caused, in whole or in part, from activities of the Contractor in performing the duties and obligations under this contract. When such defects or damage occur, within the time period described hereinbefore, in any part of the surface or subsurface work done under the contract, or in any adjacent surface or subsurface improvements not included in the work under the contract, the Contractor shall repair the same and the one year maintenance period required shall, with relation to such required repair, be extended one year from the date of completion of such repair.

H. PROSECUTION AND PROGRESS OF WORK

1. CONTRACTOR'S CONSTRUCTION SCHEDULE

Prior to beginning any work, the Contractor shall submit a written schedule to the Engineer showing the proposed order of work and indicating the time required for completion of the major items of work. This working schedule shall take into account the passage or handling of traffic with the least practicable interference therewith and the orderly, timely and efficient prosecution of the work.

In the event that the work performed does not correspond to the schedule, the Contractor shall submit a revised schedule when requested by the Engineer. The schedule will be used as an indication of the sequence of the major construction operations and as a check on the progress of the work but does not become a part of the contract documents.

2. PRECONSTRUCTION CONFERENCE

A preconstruction conference will be scheduled by the Contractor prior to the commencement of any work. The meeting is to include, but not necessarily be limited to, representatives of the following groups: owner or Engineer, Contractor and subcontractor, and affected utility companies.

The purpose of the conference will be to discuss the construction schedule and items of the work which require special coordination.

3. NOTICE TO PROCEED

Written notice to proceed will be given after the contract has been executed and the performance bond and all required insurances have been filed with and approved by the owner.

The Contractor shall notify the owner of the time and location that work will begin at least 48 hours prior to beginning work.

4. CONTRACT TIME

The contract time, unless otherwise specified, will begin with the tenth calendar day (excluding legal holidays) following the date upon which the contract and performance bond forms are mailed to the Contractor for execution.

The contract time shall be in terms of either calendar days or work days and shall be in calendar days unless otherwise specified.

Work days shall be defined as every day except Sundays and legal holidays observed by the State of Oregon subject to the exclusions hereinafter described.

Calendar days shall be defined as every day of every year subject to the exclusions hereinafter described.

Exclusions to the definitions of calendar days and work days will be those days to the nearest one half day when the Contractor is prevented from performing work under the contract for one or another of the causes or reasons: (1) Acts of God as such are defined in subsection A-1;

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(2) Epidemics, quarantine restrictions, strikes, labor disputes, freight embargoes and acts of the public enemy; (3) Periods when the work is temporarily suspended upon written order of the Engineer.

### 5. SUSPENSION OF WORK

The owner may, for good and sufficient reason, temporarily suspend the Contractor's operations on the project or upon any part of it. In the event of such suspension, the owner shall, except in emergency, give the Contractor three (3) days notice and the work shall be resumed within five (5) days after notice has been given by the owner to the Contractor to do so. The owner shall allow the Contractor an extension of time for completion corresponding to the total period of the temporary suspension and shall reimburse the Contractor for necessary rental of unused equipment, services of watchmen, and other unavoidable expenses accruing by reason of the suspension without fault of Contractor. The Contractor shall not be entitled to damages, intangible or overhead costs, or anticipated profits arising from such temporary suspension.

Pursuant to Sections E-1 and E-2, the Engineer shall have authority to suspend the work wholly or in part for cause. The Engineer will have the authority to suspend the work wholly or in part due to: failure of the Contractor to correct conditions unsafe for the workers, the general public or the owner's employees; for failure to carry out the provisions of the contract; for failure to carry out orders; for such periods as the Engineer may deem necessary due to conditions considered unsuitable for the performance of the work or for any reason deemed to be in the public interest.

Pursuant to subsection H-6, if the Contractor voluntarily suspends operations because of seasonal conditions or other unsuitable conditions, an order to suspend the work may not be required or issued. However, in all cases of suspension of construction operations, the work shall not again be resumed until permitted by order of the Engineer.

At the commencement of and during any suspension of the work, the Contractor shall be responsible for the care of the work performed and take every precaution to prevent any damage or deterioration of the work including temporary protection devices to warn, safeguard, protect, guide and inform traffic, during suspension the same as though its performance had been continuous and without interferences.

If the suspension of the work is due to failure on the part of the Contractor to correct conditions unsafe for workers or the general public, or to carry out orders given, or to perform any provisions of the contract, then and in such event, be solely responsible for making suitable provisions for necessary traffic and bear the cost of maintaining the work under the contract during the period of suspension. If the Contractor at any time fails to provide for traffic and to maintain the work, the Engineer may immediately proceed to maintain such work and the entire cost of this maintenance will be deducted from monies due or to become due the Contractor on the contract.

The Contractor's voluntary or involuntary suspension or slowdown, with or without the approval of the Engineer, and suspension of the work ordered by the Engineer will not be grounds for claims by the Contractor for damages, idle equipment or labor, or extra compensations. No allowance or compensation will be made on account of such suspensions or work except as

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provided hereinbefore and as provided in subsection H-4 and H-6.

The Contractor shall be responsible for damage to the work that may occur during suspensions of work the same as though the damage had occurred while the work was in progress.

### 6. DELAYS AND EXTENSIONS

The owner may grant extensions of time to the extent it finds reasonable and justified when the delay is due solely to causes beyond the control of the Contractor and subcontractors and without any fault or negligence or participation by them.

Causes which will be given consideration for an extension of contract time include, but are not limited to, the following:

- a. Errors, changes or omissions in the plans, or errors or changes in the specifications.
- b. Failure of the owner, its representatives and its other Contractors to act promptly in carrying out obligations and duties.
- c. Failure of the owner to submit the contract and bond to the Contractor for execution.
- d. Performance of Extra Work as described in subsection D-9.
- e. Court orders enjoining the prosecution of the project or an act of the owner not authorized by the contract or permitted by law.

The owner will not consider an extension of contract time based on shortage or inadequacy of labor and equipment, negligence or fault of the Contractor, and other deficiencies or lacks which are within the province of the Contractor's control or responsibility. Nor will the owner consider an extension of contract time due to seasonal weather or seasonal inclement weather.

If, in the judgement of the Engineer, insufficient force is being employed, or inadequate equipment and methods are used, or if progress is for any reason unduly delayed, the Engineer may instruct the Contractor in writing to increase the force or equipment, or adopt improved methods to expedite the work, and the Contractor shall heed and follow such instructions, but conformity to the Engineer's instructions shall not relieve the Contractor of any responsibilities under this contract.

An extension of contract time will be considered only if the Contractor has given written notice to the owner of the cause of delay, and makes claim for such extension prior to

the contract completion date. The decision by the owner of the term of any extension or detail thereof shall be final.

If work under a contract pursuant to subsection (1) of ORS 279.326, and is not the result of a labor dispute but the contract is not terminated, the Contractor is entitled to a reasonable extension of the contract time and reasonable compensation for all costs resulting from the suspension plus a reasonable allowance for overhead with respect to such costs.

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7. LIQUIDATED DAMAGES

Time shall be considered the essence of the contract. If the Contractor fails to complete the project or to deliver the supplies or perform the services within the time specified in the contract or any extension thereof by the owner, the actual damage to the owner for the delay will be substantial but will be difficult or impractical to determine.

It is therefore agreed that the Contractor will pay to the owner, not as a penalty but as liquidated damages, the per diem amount set forth in the herein given Schedule of Liquidated Damages or modification thereof as given in the special provisions for each and every such day, as pertinent, elapsed in excess of the contract time or the final adjusted contract time applicable to the work required under the contract.

SCHEDULE OF LIQUIDATED DAMAGES

Original Amount of Contract		Per Diem Amount of Liquidated Damages	
For More Than, Up To, and Including		Calendar Day*	Workday
\$ 0	\$ 25,000	\$ 30	\$ 42
25,000	50,000	50	70
50,000	100,000	75	105
100,000	500,000	100	140
500,000	1,000,000	150	210
1,000,000	2,000,000	200	280
2,000,000	-----	300	420

\*Calendar day amounts are applicable when the contract time is expressed on the calendar day, or fixed date basis.

Permitting the Contractor to continue and finish the work or any part thereof after the contract time or adjusted contract time, as pertinent, has expired shall in no way operate as a waiver on the part of the owner or any of its rights under the contract.

Payment of liquidated damages shall not release the Contractor from obligations in respect to the fulfillment of the entire contract, nor shall the payment of such liquidated damages constitute a waiver of the owner's right to collect any additional damages which may be sustained by failure of the Contractor to carry out the terms of the contract, it being the interest of the parties that said liquidated damages be full and complete payment only for failure of the Contractor to complete the work on time.

8. CONTRACTOR'S REPRESENTATIVE

The Contractor shall designate in writing before starting work an authorized representative, who shall have complete authority to represent and to act for the Contractor in his absence from the work site, in all directions given to him by the Engineer. The Contractor or the authorized representative shall give efficient supervision to the work, using the best skill and personal attention to the prosecution of the work, and shall be present on the site continually during its progress.

If called for in the contract documents, the Contractor shall maintain an office on or adjacent to the site of the project. The Contractor shall keep a complete copy of the plans and specifications on or near the site at all times. If the Contractor and the authorized representative are not present on any part of the work where it may be necessary to give instructions, directions may be given by the Engineer to the superintendent or foreperson who may have charge of that particular part of the project, and such order shall be received and followed. Such directions shall not be deemed to change the status of Contractor or subcontractor, nor to make the owner an employer, nor to give the owner direct responsibility for the methods and manner of the work. Such directions of major importance will be confirmed in writing. Any direction will be so confirmed in each case on written request from the Contractor.

Incompetent, careless or negligent employees or agents shall be forthwith discharged by the Contractor upon written request of the Engineer, and failure to comply with such request shall be sufficient grounds for termination of the contract.

9. CONTRACTOR'S EQUIPMENT

The Contractor shall at all times employ sufficient and suitable equipment for prosecuting the work to full completion in the manner and time required by the terms of the contract.

On force account work the equipment and tools used shall be adequate in all respects for efficient performance of the force account work under the direction of the Engineer. The Engineer shall have the authority to refuse the use of equipment and tools on force account work which, in the Engineer's judgement are unsuitable for the work.

Should the Contractor fail to furnish suitable and sufficient equipment for the proper prosecution of the work, the Engineer may suspend the work by written notice until such orders are complied with and such deficiencies are corrected as provided in subsection H-5.

10. CONFLICTS, ERRORS AND OMISSIONS

The Contractor shall check and compare all plans prior to construction and notify the Engineer of any discrepancies or omissions in order to permit correction by the Engineer. Coordination of plans and specifications is intended. The Contractor shall furnish labor and materials required for the work if indicated on one and not the other as fully as if mentioned or indicated on both; and should any work or materials be reasonably required or intended for carrying the project to completion which are inadvertently omitted on the plans or specifications, the

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Contractor shall furnish the same as fully as if particularly delineated or described.

It is understood to be the intent of the plans and specifications to show and describe a complete project within the limits shown. Dimensions shown on the plans shall be used rather than scaled measurements. Whenever it may appear that the plans are not sufficiently detailed or explicit, the Engineer may furnish additional detail drawings or written instructions and the Contractor shall perform the work to such additional details or instructions. In case of conflict between the requirements set forth in the contract documents, the provisions for order of precedence in subsection D-3 shall apply.

### 11. OWNER'S RIGHT TO DO WORK

If the Contractor should neglect to prosecute the project properly or fail or refuse to perform any of the terms or conditions of the contract, the owner may, without prejudice to any other remedy, supply or correct any deficiency or defect. Such action by the owner shall be taken only after three days notice by the Engineer to the Contractor and his surety, unless in the judgement of the Engineer an emergency or danger to the work or to the public exists, in which event action of the owner as set forth above may be taken without any notice whatsoever. The cost of such action by the owner shall be deducted from the payment then or thereafter due the Contractor. The Contractor shall pay to the owner any excess of cost over such a payment due.

### 12. USE OF IMPROVEMENT DURING CONSTRUCTION

The owner shall have the right to take possession of and use any completed or partially completed portions of the work. Such use shall not be considered as final acceptance of any portion of the work. If such prior use increases the cost of, or delays the work, the Contractor shall be entitled to such extra compensation or extension of time, or both, as the Engineer may determine.

### 13. TERMINATION OF CONTRACT

All terms and conditions of the contract are considered material, and failure by the Contractor to comply with any of said terms or conditions shall, at the owner's option, be deemed a breach of the contract. Upon such failure, the owner shall have the right, whether an alternative right is provided or not, to declare the contract terminated. The issuance by the owner or by the Engineer of an order stating that the contract is terminated, and service of a copy of said order upon the Contractor and the Contractor's surety shall be deemed a complete termination of the contract. Upon the contract being so terminated, the owner may retain all sums due under the contract and both the Contractor and his sureties shall be liable under the bond for all losses, expenses and damages caused to the owner by reason of failure to complete the contract and the surety shall be required, at the owner's option, to complete the project. Notwithstanding such termination, the Contractor and the Contractor's sureties shall remain liable under the terms of the contract for work performed prior to such termination.

In conformance with the requirements of ORS 279C.660, the owner and the

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Contractor may agree to terminate the contract:

a. If work under the contract is suspended by an order of the owner for any reason considered to be in the public interest other than by a labor dispute or by reason of any third-party judicial proceeding relating to the work other than a suit or action filed in regards to a labor dispute; and

b. If the circumstances or conditions are such that it is impracticable to extend the contract time pursuant to ORS 279C.665.

In the event of termination of a public contract pursuant to ORS 279C.660, provision shall be made for the payment of compensation to the Contractor. In addition to a reasonable amount of compensation for preparatory work and for all costs and expenses arising out of termination, the amount to be paid to the Contractor:

a. Shall be determined on the basis of the contract price in the case of any fully completed separate item or portion of the work for which there is a separate or unit contract price; and

b. May, with respect to any other work be a percent of the contract price equal to the percentage of the work completed.

### 14. DEFAULT BY CONTRACTOR

If the Contractor fails to begin work as required by the contract, or be adjudged bankrupt, or make a general assignment for the benefit of his creditors, or a receiver is appointed on account of insolvency, or if at any time when work has been resumed after a Suspension of Work (pursuant to subsection H-5) the Contractor refuses, neglects or fails to correct the deficiency(s) or reason(s) for the suspension, or if the Contractor abandons the work, the Engineer may give written notice of default to the Contractor and the Contractor's surety, and shall discontinue or not begin the work, and any or all payments due or that may become due the Contractor may be withheld by the owner until the completion by the owner, surety, or another person of all work included in the contract, and until expiration of any maintenance and/or warranty period.

After service on the Contractor of such order to desist from work or part thereof, or notice of termination as set forth in subsection H-13, the owner may take possession of the project or such designated part thereof, and may use all or any part of the Contractor's plant, tools, equipment, materials or other property on the project, none of which shall be removed by the Contractor as long as they may be required for the work, and the owner may, by contract or otherwise, provide supervision of workers, materials, appliances and equipment necessary for the completion of, and may complete the project or such designated part thereof. The expense so incurred for completion of the project or part thereof, together with all damages, liquidated or

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otherwise sustained or to be sustained by the owner shall be deducted from the fund or appropriation set aside for the purpose of the contract and shall be charged to the Contractor as if paid. In case the amount of such expenses and damages exceeds the sum which would have been payable under the contract if completed entirely by the Contractor, the amount of such excess shall be paid to the owner by the Contractor and both the Contractor and the Contractor's sureties shall be liable to the owner therefore; in case the amount of such expenses and damages shall be less than the sum which would have been payable under the contract if completed entirely by the Contractor, he shall be entitled only to payment in accordance with contract terms for the work the Contractor actually performed, subject, however, to all terms of said contract.

The Contractor shall complete all work unless an order to desist as provided above has been received and shall cooperate with and in no way hinder or interfere with forces employed by the owner or others.

Upon completion of the project by others, the Contractor shall be entitled to the return of all material which has not been used in the work or which has not been paid for, and for all plant, tools, equipment and other property, provided, however, that no claim will be allowed because of usual and ordinary depreciation, loss, wear and tear.

None of the foregoing provisions, or the provisions in subsection H-13 shall be construed to require the owner to complete the work, nor to waive or in any way limit or modify the provisions of the contract relating to the fixed and liquidated damages suffered by the owner on account of the failure of the Contractor to complete the project within the time prescribed.

### 15. COMPLETION AND ACCEPTANCE

After completion of all items of work specified in the contract, and completion of the final inspection as set forth in subsection E-20, the Engineer will recommend to the owner that the work be accepted, and payment be made as provided for in subsection J-10.

It is mutually agreed between the parties to the contract that a certificate of completion of the project, submitted by the Engineer or other officer of the owner and approved by the governing body of the owner, shall constitute final acceptance of the work and materials included in the contract on the date of such approval. It is provided further that such approval shall not constitute an acceptance of any authorized work, that no payment made under the contract except the final payment shall be evidence of the performance of the contract, either

wholly or in part, and that no payment shall constitute an acceptance of unauthorized or defective work or improper material.

The acceptance of the contract work shall not prevent the owner from making claim against the Contractor for any defective work if same is discovered within the guaranty period.

All work shall be and is guaranteed by the Contractor for a period as specified after the date of final acceptance of all the work by the owner.

If, within said guaranty period, repairs or changes are required in connection with guaranteed work, which, in the opinion of the Engineer, is rendered necessary as the result of the

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use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the contract, the Contractor shall, promptly upon receipt of notice from the owner, and without expense to the owner,

a. place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein; and

b. make good all damage to the building or site, or equipment or contents thereof, which in the opinion of the Engineer, is the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the contract; and

c. make good any work or material, or the equipment and contents of building, structure or site disturbed in fulfilling any such guarantee.

If the Contractor, after notice, fails within ten (10) days to proceed to comply with the terms of this guaranty, the owner may have the defects corrected, and the Contractor and his surety shall be liable for all expense incurred, provided, however, that in case of an emergency where, in the option of the Engineer, delay would cause serious loss or damage, repairs may be made without notice being given to the Contractor and the Contractor shall pay the cost thereof.

J. MEASUREMENT AND PAYMENT

1. MEASUREMENT OF QUANTITIES

Payments shall be based on measurements of the completed work in accordance with United States Standard Measures. The units of measurement for payment shall be as shown or specified. In calculating quantities, all lengths and areas will be based on horizontal and vertical measurements unless otherwise specified.

Basis is defined as the particular standard unit of measurement which will be applied to a particular item of work as shown.

Each basis of measurement herein set forth is generally applicable and will be in effect.

Linear measurement of pay lengths will be by the linear foot, measured along the line and grade of the item involved as actually placed and accepted.

Volume of earthwork, particularly excavation and embankment, will be computed by the average end area method or by other methods of equivalent accuracy.

Volumes of materials measured in the vehicles by which they are transported, termed Vehicle Measurement, will require computing of the volume of the vehicle to the nearest 0.1 cubic yard for its approved capacity, and identification of the vehicle and its capacity. Pay quantities will be determined by vehicle measurement at the point of delivery with no allowance for settlement of material during transit. Loads shall be level and uniform. Measurement will not be made for material in excess of the approved capacity of the vehicle and deductions will be made for loads below the approved capacity.

Volumes of concrete and masonry in structures will be measured according to neat lines as shown on the plans or as altered on order of the Engineer.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard may be weighted and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

When payment for materials other than bituminous cements is on a weight basis and unless otherwise set forth in the specification under which the material is to be furnished, the pay quantities will be determined by weighing the material on weigh scales provided by the Contractor as set forth hereinafter.

Such weighing is to be of material in the hauling vehicle as loaded for delivery of the material to the place of its incorporation in the work. The determination of tare weights and the weight of loaded vehicles will be to the nearest ten pounds. Tare weights will be determined by weighing empty vehicles at intervals of such frequency as the Engineer deems necessary to insure accuracy of pay load weights.

Portland cement will be measured by the pound, hundredweight, ton, sack, bag or barrel. The term Barrel of cement will mean 376 pounds, avoirdupois. The terms Sack and Bag of cement will each mean 94 pounds, avoirdupois.

The quantities of asphalt cements, liquid asphalt materials and other bituminous

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cements normally shipped in tank cars or tank trucks, when they are to be paid for by the gallon (U.S. Standard) or by the ton, will be determined from volume computations of the materials when at a temperature of 60 degrees F., with standard recognized correction factors applied when the materials are measured at any temperature other than 60 degrees F. Net certified scale weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When bituminous materials are shipped by truck or transport, net certified weights or volume, subject to correction for loss of foaming, may be used for computing quantities.

Weights of materials and of metallic coatings will be determined on the basis as set forth in the specification under which their use is required.

The term Lump Sum when used as the basis of payment will mean complete payment for the work described to be done, complete and accepted without further measurement, as such work is covered under the applicable lump sum pay item.

The term All Required when used as the item of payment will mean that measurement for the item of work is to be on an All Required basis and that the corresponding payment is to be at a lump sum bid price. It is understood that the lump sum payment will be in effect without further measurement unless changes are ordered in writing by the Engineer.

When the contract specifies for materials which are to be measured by weighing on scales, the Contractor shall provide the scales at no expense to the owner and shall transport the materials so they can be weighed on the scales provided.

The scales shall be of a size, capacity, kind and type suitable for the weighing to be done and shall be properly and adequately installed. Before use of scales is commenced, and as frequently thereafter as the Engineer may deem necessary to insure accuracy, the Contractor shall, at the Contractor's expense, have the scales certified by the Oregon Department of Weights and Measures.

The Contractor shall be responsible for maintaining the scales in an accurate condition at all times.

The Contractor shall furnish scales and so locate the scales so that the amount of hauling involved in the delivering of the materials is no greater than if no weighing were required. If hauling of materials is to be paid for as a separate pay item, the pay distance shall include only the distance via the most direct practicable route from the place of loading to the place of deposit and no allowance will be made for any extra hauling required to reach the scales.

### 2. SCOPE OF PAYMENT

The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, labor, tools and equipment necessary to the completed work and for performing all work contemplated and embraced under the contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the owner, and for all risks of every description connected with the prosecution of the work; also for all expenses incurred in consequence of the suspension or discontinuance of the work as herein

## GENERAL CONDITIONS

specified; and for completing the work according to the plans and specifications.

Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

The unit contract prices for the various bid items of the contract shall be full compensation for all labor, materials, supplies, equipment, tools and all things of whatsoever nature required for the complete incorporation of the item into the work the same as though the item were to read "In Place", unless the plans and special provisions shall provide otherwise.

### 3. COMPENSATION FOR ALTERATION OF CONTRACT

When the character of the work or the unit costs thereof are materially changed, pursuant to subsection D-6, compensation for such work will be made on such basis as may have been agreed to in advance of the performance of the work. When no such basis has been previously agreed upon, then an allowance may be made, either for or against the Contractor, in such amount as the Engineer may determine to be fair and equitable.

### 4. ELIMINATED ITEMS

The Engineer shall have the right to eliminate, omit or cancel (herein collectively termed elimination) the portions of the contract relating to the construction of any item or part of any item therein by payment to the Contractor of a fair and equitable amount covering all items of actual cost incurred directly in connection with the eliminated work and prior to the date of elimination of the work by order of the Engineer. Where practicable, the work completed before elimination shall be paid for at unit prices, otherwise the Contractor will be allowed a profit percentage on the materials used and construction work actually performed at rates as provided in subsection J-6 for force account work, but no allowance will be made for anticipated profits. Acceptable materials ordered by the Contractor, delivered on the work or properly stored at sites approved by the Engineer prior to the date of elimination of the work by order of the Engineer, will be purchased from the Contractor by the owner at actual cost, and thereupon shall become the property of the owner.

### 5. PAYMENT FOR EXTRA WORK

Upon written order by the Engineer, the Contractor shall carry out such work at prices agreed upon between the Contractor and the owner, but in no event exceeding the unit prices established in the contract. When such order pertains to work of a class or classes for which no unit prices are so established, then the agreed adjustment shall be based either on unit prices decided on fair and equitable grounds or shall be a lump sum similarly decided, as the owner may determine, or such work may be done on a force account basis. In no case shall the Contractor make any claim for extra work unless ordered as such.

### 6. PAYMENT FOR FORCE ACCOUNT WORK

When extra work is ordered to be done on a force account basis, such work will be paid for on the basis of cost plus certain percentage allowances.

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The items of cost for which payment will be made and to which payment will be restricted, together with the percentage allowance applicable to the respective items, are as follows:

<u>Items of Cost for Which Payments Will be Made</u>	<u>Percentage Allowance Additional to Actual Cost</u>
Labor, including time of foreperson, while engaged directly upon force account work.	20
Industrial accident insurance, unemployment compensation contributions and social security for old age and assistance contributions incurred or required under statutory law and these standard specifications.	15
The amount paid to, or in behalf of, workers by reason of subsistence and travel allowances, health and welfare benefits, pension fund benefits or other benefits, when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work.	15
Materials and supplies actually used in the force account work.	15
Rental on each piece of equipment having a value in excess of one hundred dollars, provided the rental rate does not exceed the current rates established by the Associated General Contractors, Oregon Chapter.	15

The payment to be made for labor used in the work will be computed at the rates actually paid by the Contractor or subcontractor, plus the allowance set forth above, unless these rates are in excess of the current local rates, in which event the payment shall be computed at the current local rate, plus allowances. The time allowed shall be the number of hours worked directly on force account operations.

Payment for purchased materials and supplies used on force account work will be computed at the prices billed to the Contractor or subcontractor by the supplier, less all discounts plus the allowance set forth hereinbefore. It shall be presumed that the Contractor or subcontractor has taken advantage of all possible discounts on bills for materials and supplies, and such discounts shall be subtracted from the total amounts of bills regardless of any failure of the Contractor to take

## GENERAL CONDITIONS

advantage of same.

Freight and express on material and supplies will be considered to be a part of the cost of the materials and supplies and will be paid for as materials and supplies.

Materials and supplies produced by the Contractor or a subcontractor will be paid for at prices to be agreed upon between the Contractor and the Engineer.

Rental on equipment used will be computed at the rates actually paid by the Contractor or subcontractor plus the allowance unless these rates are in excess of the current local rates, or unless the equipment is owned by the Contractor or subcontractor. In either of which events payments shall be computed at rates to be agreed upon between the Contractor and the Engineer prior to beginning work, which rates shall in no case be greater than the current local rates.

When a piece of equipment and the operators thereof are hired, rented, or furnished as a unit, the additional percentage to be allowed shall be 5 percent, and the Contractor shall not be entitled to 15 percent on the time of the operators of such equipment. Neither shall the Contractor be entitled to payment for contributions made under the terms of the Workmen's Compensation Act, the Unemployment Compensation Act, or the Social Security Act to cover the time of operators of equipment hired, rented or furnished on this basis.

For equipment rented on a day or hour basis, rental will be allowed for only those days or hours during which the equipment is in actual use. For equipment rented on a monthly basis, straight time rental will be allowed from the day the equipment is first used on the particular piece of force account work until and including the last day on which it is used on that particular work, excluding, however, the time during which the equipment is used on other work during the period, and further excluding the time that the equipment is idle for a continuous period of more than six days.

The rentals allowed for equipment will in all cases be understood to cover all fuel, supplies, repairs, and renewals, and no further allowances will be made for those items unless specific agreement to that effect is made in writing before the work is commenced. Individual pieces of equipment having a value of one hundred dollars or less will be considered to be tools or small equipment, and no rental shall be allowed on such.

The percentage allowances made to the Contractor in accordance with the terms outlined above will be understood to be reimbursement and compensation for all superintendence, use of tools and small equipment, overhead expense, bond cost, insurance premiums, profits, indirect costs and losses of all kinds, and all other items or cost not specifically designated herein as items for which payment is to be made, whether the service, costs and other items involved are furnished or incurred by the Contractor or by the subcontractor. No other reimbursement, compensation or payment shall be made for any such services, costs or other items.

Should any percentage allowance or other corresponding allowance be made by the Contractor to a subcontractor in connection with force account work, such allowance shall be at the sole expense of the Contractor and the Contractor shall not be reimbursed or otherwise compensated for the same by the owner.

All claims for extra work done in any month shall be filed in writing by the Contractor with the Engineer before the fifth of the following month, and such claims shall show

## GENERAL CONDITIONS

the names and number of each worker employed thereon, the date and the number of hours so employed, the character of work, and the wages paid or to be paid; also the claim shall show the materials delivered for the extra work, the quantity and character of such materials, from whom purchased, and the net amount paid, or to be paid therefore.

### 7. PROGRESS PAYMENTS

At a regular period each month the Engineer will make an estimate of the amount of work completed and of the value of such completed work. The sum will hereinafter be collectively referred to in this subsection as the "value of completed work". With this estimate as a base, a partial payment will be made to the Contractor, which partial payment shall be equal to the value of completed work, less such amounts as may have been previously paid, less such other amounts as may be deductible or as may be owing and due to the owner for any cause, and less an amount to be retained in protection of the owner's interests.

The amount to be retained in protection of the owner's interest is not to include the full amounts earned under force account work performed during the period covered by the respective partial payments.

The amount to be retained from any given partial payment will be such that when added to the sum of amounts previously retained will bring the total of amounts retained equal to five percent of the value of completed work, unless otherwise specified.

Such amount of retainage shall be withheld and retained by owner until it is included in and paid to Contractor as part of the final payment of the contract amount.

If the Contractor fails to complete the project within the specified contract time, or any extension thereof, no additional progress payments will be made until the project is completed.

The making of progress payments shall, under no circumstances, be construed as an acceptance of any of the work or materials under the contract.

Payments for all work under the contract will be made at the price or prices bid therefore, and the prices shall include full compensation for all incidental work.

No progress payment will be made until Contractor has filed wage certification as described in subsection G-10.

Progress payments will be prepared on or about the 25th of each month and are payable to the Contractor within 30 days after receipt of invoice from the Contractor.

### 8. DEFERMENT OF PAYMENTS

No payment will be made until all orders made by the Engineer to the Contractor in accordance with the specifications are complied with, nor until all claims or liens filed or prosecuted against the owner, its officers or employees contrary to the provisions of the contract are satisfied.

In the event a complaint or charge of unlawful employment practices pursuant to the provisions of ORS Chapter 659 is filed against the Contractor with the Commission of Labor, and the Commissioner of Labor issues a cease and desist order as defined in ORS 659.010, no further payments will be made on the contract until such time as all of the provisions of the cease and desist order have been complied with by the Contractor.

9. FINAL ESTIMATE AND PAYMENT

The Contractor shall notify the Engineer when work is considered complete and the Engineer shall, within fifteen (15) days after receiving the notice, either accept the work or notify the Contractor of work yet to be performed on the contract. If accepted, the Engineer shall so notify the Contractor and will make a final estimate and recommend acceptance of the work as of a certain date. Upon approval and acceptance by the owner, the Contractor will be paid a total payment equal to the amount due under the contract including all retainage.

Prior to final payment, the Contractor shall deliver to the owner a receipt for all amounts paid or payable to the Contractor and a release and waiver of all claims against the owner arising from or connected with the contract and shall furnish satisfactory evidence that all amounts due for labor, materials, and all other obligations have been fully and finally settled or are fully covered by insurance.

10. ACCEPTANCE OF FINAL PAYMENT

The acceptance by the Contractor of the final payment shall release the owner and the Engineer as agent of the owner from all claims and all liability to the Contractor for all things done or furnished in connection with the work, and every act of the owner and others relating to or arising out of the work. No payment, however, final or otherwise, shall operate to release the Contractor or the Contractor's sureties from obligations under the contract and the performance, payment and other bonds and warranties, as herein provided.

11. FINAL GUARANTY

All work shall be and is guaranteed by the Contractor for a specified period from and after the date of final acceptance of all the work by the owner.

If, within said guaranty period, repairs or changes are required in connection with guaranteed work, which, in the opinion of the Engineer is rendered necessary as the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the contract, the Contractor shall promptly upon receipt of notice from the owner, and without expense to the owner:

(a) place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein;

(b) make good all damage to the building or site, or equipment or contents thereof, which in the opinion of the Engineer, is the result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the terms of the contract; and

(c) make good any work or material, or the equipment and contents of building, structure or site disturbed in fulfilling any such guarantee.

If the Contractor, after notice, fails within ten days to proceed to comply with the terms of this guaranty, the owner may have the defects corrected, and the Contractor and the Contractor's surety shall be liable for all expense incurred, provided, however, that in case of an

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emergency where, in the opinion of the Engineer, delay would cause serious loss or damage, repairs may be made without notice being given to the Contractor and the Contractor shall pay the cost thereof.

### 12. ARBITRATION

Contractor and Customer will submit all complaints, disputes and/or controversies that may arise out of or in connection with this Contract, and which might be pleaded or urged in a counterclaim or set off to a suit or action to enforce payment, to binding arbitration under the laws of the State of Oregon, and in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association in effect at the time. Notwithstanding any rule to the contrary, either party will have the option to initiate arbitration according to the American Arbitration Association rules and subject to its administration, or to demand and compel arbitration according to the procedures set out at Oregon Revised Statutes, Chapter 36. The decision of the arbitrator(s) will be final and binding upon both parties.

SECTION 01 56 39 – TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
  - 1. General protection of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction, and both within and outside the limits of work of the project.
  - 2. Installation and maintenance of erosion control measures, such as Silt Fence, before and during construction.

1.3 Related Sections:

- A. Section 31 10 00 – Site Clearing
- B. Section 31 20 00 – Earth Moving
- C. Section 31 25 00 – Temporary Erosion & Sediment Control

1.4 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at DBH (4.5 feet above the ground).
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction. The boundary of the tree protection zone shall be the tree's canopy dripline or the area as indicated on Drawings.
- C. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of the following:

1. Organic Mulch: One-half (1/2) pound of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
  2. Protection-Zone Fencing: Assembled samples of manufacturer's standard size made from full-size components may be installed and reviewed for approval on-site.
- C. Qualification Data: For qualified tree service firm.
- D. Certification: Certify that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- E. Maintenance Recommendations: For care and protection of trees affected by construction during and after completing the Work.
- F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
1. Use sufficiently detailed photographs or videotape.
  2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- G. Warranty: Sample of special warranty.

#### 1.6 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work like that required for this Project.
- B. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
    - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
    - b. Enforcing requirements for protection zones.
    - c. Field quality control.

#### 1.7 PROJECT CONDITIONS

- A. Park construction requires work within tree driplines and under tree canopies. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Erection of sheds or structures.
  4. Impoundment of water.

5. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.
- D. Excavation under trees within five (5) feet of the trunk will require hand digging.

## 1.8 WARRANTY

- A. Special Warranty: Contractor agrees to repair or replace existing and new plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by the County, or incidents that are beyond Contractor's control.
    - b. Structural failures including plantings falling or blowing over.
  2. Warranty Periods from Date of Project Completion:
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
  3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    - b. Replace plants ` are more than 25 percent dead or in an unhealthy condition at end of warranty period or are damaged during construction.
    - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
    - d. Provide warranty for period equal to original warranty period, for replaced plant material.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

1. Topsoil:
  - a. Native Topsoil shall be on-site existing topsoil after all rocks over two inches and all foreign debris have been removed. Native topsoil shall be free of any substance harmful to plant growth and shall have organic material and soil characteristics capable of sustaining healthy plant life. Heavy clay soil shall not be considered for use as topsoil.
  - b. Import Topsoil: If the stockpile of existing topsoil is not adequate to meet the requirement to place minimum of 6 inches of topsoil in all planting areas import topsoil shall be used to meet the requirement. Imported topsoil shall be sandy

loam, or a mixture of sandy loam and aged compost, screened and friable and with structure adequate to give good tilth and aeration. It shall be free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand and any extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants; or other pests, pest eggs, or undesirable organisms and disease-causing plant pathogens. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

- c. All imported topsoil shall have an agricultural suitability test, dated within thirty (30) days of delivery and indicating compliance with these specifications, by a qualified soils laboratory prior to delivery to the job site. Results shall be sent to the Owner's Representative.
  2. Organic Mulch: Organic Mulch material shall be locally produced arbor chip mulch from tree and shrub trimming, 100% recycled material, with no color additive. Mulch shall not contain significant amounts of trimmings from pine or cedar unless well-aged. The mulch shall not contain trimmings from eucalyptus trees, or any noxious weeds, plants with thorns or spines, or invasive plants. The largest allowable pieces not larger than 3" in any direction. Bark mulch or shredded redwood bark mulch ("Gorilla hair") shall not be used.
- B. Tree Protection-Zone and Silt Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Owner's Representative.
1. Plastic Protection-Zone Fencing: 6ft high (min.) plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi secured with plastic bands or galvanized-steel or stainless-steel wire ties
    - a. Contractor shall submit method for supporting, securing, and maintaining posts and fence throughout project, for approval prior to construction.
    - b. Color: High-visibility orange, nonfading.
- C. Signage: Contractor shall install warning/protection signs at existing trees to remain. Tree Protection Zone Signage.
1. Protect Tree Value Signage: Shop-fabricated, rigid plastic, metal sheet, or other material that is weather resistant for at least one year with attachment holes pre-punched and reinforced; legibly printed with non-fading lettering and as follows:
    - a. Lettering: 3-inch-high minimum
    - b. Sign Size: approximately 14 inches by 20 inches
    - c. Each sign to read: "Protect Tree"
- D. Tree Root Protection Fabric: GEOCOIR DeKoWe 400 fabric or approved equal.
- E. Tree Watering System: Trees in immediate construction areas and subject to stress of root pruning will require periodic watering as determined by the Owner's Arborist. Owner's Arborist will propose a watering method before installation. Contractor may submit an alternate watering system for approval, prior to construction.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. All trees on site are to remain.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed thickness of mulch.
  - 1. Prior to placing mulch, apply tree root protection fabric. Do not place protection fabric or mulch within 2-feet of tree trunks.
  - 2. Apply 6-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

#### 3.3 TREE AND PLANT PROTECTION ZONES AND SILT FENCING

- A. Protection Zone and Silt Fencing: Install fencing along edges of tree protection zones and at the project boundaries as shown in the Drawings before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or close to street intersections, drives, or other vehicular circulation.
  - 1. Fencing for tree protection zones may be combined when trees are close to each other with the approval of the Owner's Representative.
- B. Maintain protection zones free of weeds and trash.
- C. Repair or replace trees, shrubs, and other vegetation indicated to remain that are damaged by construction operations, in a manner approved by Owner's Representative.

- D. Maintain protection-zone and silt fencing in good condition as acceptable to Owner's Representative and remove when construction operations are complete, and equipment has been removed from the site.
  - 1. Do not remove protection-zone fencing and silt fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
  - 2. Temporary access is permitted subject to preapproval in writing by Owner's Representative if a root buffer effective against soil compaction is constructed. Maintain root buffer so long as access is permitted.

### 3.4 EXCAVATION

- A. General
  - 1. Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving."
  - 2. Excavation within Tree Protection Zones shall be as directed by the Owner's Arborist.
- B. Excavation and trenching near Trees: Where excavation and/or utility trenches are required within protection zones and/or within 5-feet of the trunk, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots, taproots, or any tree root greater than 4-inches in width; cut only smaller roots that interfere with construction and the installation of utilities. Cut roots with sharp tools for a clean cut as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. If roots greater than 4-inches in width are discovered, Owner's Arborist is to be consulted immediately.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots 4" wide or greater, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

### 3.5 ROOT PRUNING

- A. Roots larger than 4" diameter shall not be damaged or cut, without written permission of Owner's Arborist. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots cleanly, manually, by digging a trench and cutting exposed roots with sharp pruning instruments; do not saw, break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  2. Cut Ends: Do not paint cut root ends.
  3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  4. Cover exposed roots with burlap, and water regularly.
- B. Root Pruning at Edge of Protection Zone: If required by the work, prune roots 12 inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with an air spade to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

### 3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches only as directed by Owner's Arborist. Branches affected by the work shall be, at a minimum:
1. Tied back, if flexible branches, temporarily when appropriate.
  2. Pruned only to remove injured, broken, dying, or dead branches, unless otherwise indicated. Do not prune for shape, except as approved by Owner's Arborist.
  3. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system, except as approved by Owner's Arborist.
  4. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
    - a. Type of Pruning: raising or reducing for clearance.
- B. Unless otherwise directed by Owner's Arborist do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning, including for weather damage, during Contract period as recommended by Owner's Arborist.
- F. Chip removed branches and spread over areas identified by Owner.

### 3.7 REGRADING

- A. Minor Grade Lowering within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees unless otherwise indicated.
1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

- B. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

### 3.8 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain that are damaged by construction operations, in a manner approved by Owner's Representative.
  - 1. Submit details of proposed root cutting and tree and shrub repairs.
  - 2. Have qualified personnel perform the root cutting, branch pruning, and damage repair of trees and shrubs.
  - 3. Perform repairs within 24 hours.
  - 4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Owner's Representative.
  
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the warranty period or are damaged during construction operations that Owner's Representative determines are incapable of restoring to normal growth pattern.
  - 1. Provide new trees of same size and species as those being replaced for each tree that measures 4 inches or smaller in caliper size.
  - 2. Provide two new tree(s) of 4-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.
  - 3. Replacement trees should be predominantly native species as defined in Paragraph 1.3.B of these Specifications and as approved by the Owner's Representative that are not highly susceptible to disease.
  - 4. Plant and maintain new trees per the industry standard of care and direction by the Owner's Representative.

### 3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

- END OF SECTION -

## SECTION 03 37 13 – SHOTCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes shotcrete applied by wet-mix process for the following elements:
  - 1. Base for Infinity Tree
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures."
  - 2. Division 06 Section "Exterior Carpentry"
  - 3. Division 32 Section "Landscape Concrete"
- C. The Contractor shall be responsible for providing structural reinforcement for all shotcrete elements as part of this section.

#### 1.3 DEFINITIONS

- A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.
- B. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.
- C. Specialty Fabricator: Preparer of specialty items to be provided by Owner.

#### 1.4 SUBMITTALS

- A. Product Data:
  - 1. For manufactured materials and products including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.
  - 2. Waterproofing materials when indicated for pools or streams.
- B. Shop Drawings: For details of fabricating, bending, and placing reinforcement. Include support and anchor details, number and location of splices, and special reinforcement required for openings through shotcrete structures.

1. Factory bent reinforcement shop drawings shall include layout placement both horizontal and vertical with reference plan locations.
2. Reinforcement bars #4 and smaller shall be hand bent in the field and subject to the design observation of the Owner's Representative to achieve the intended surface simulation.
3. Shop drawings shall include sections to indicate the vertical walls with leaning faces and opposing clearances required to other walls.
4. Shop drawings shall indicate locations and types of joints in concrete, including vertical joints and the horizontal joint that will be between shotcrete and wood portions of the Infinity Tree. Show how vertical joint fits in pattern and texture of Infinity Tree finish, including joint depth, width, and appearance.
  - a. Show reinforcing bars or dowels through joints, including types, dimensions, etc.
5. Contractor shall provide stamped shop drawings including wall footings prepared by an engineer licensed in State of Oregon and meeting the requirements of the local jurisdiction

C. Mockup:

1. Infinity Tree: Approximately 4 feet by 8 feet, to illustrate quality of finishes, colors, and textures of exposed surfaces of shotcrete for both interior and exterior of Infinity Tree. See 1.5.C. of this section of the specifications. Mockup or Mockups shall be sufficient to completely show each finish required and each design mix, shooting orientation, and nozzle operator to demonstrate aesthetic effects and set the quality standard for installation.
  - a. Hollows: Surface finish and colors of shotcrete shall match surface of tree, per the approval of the Owner's Representative.
  - b. Interior of Tree: Surface finish and colors of shotcrete shall match surface of tree, per the approval of the Owner's Representative.
  - c. Exterior of Tree: Surface finish and colors of shotcrete shall match surface of tree, per the approval of the Owner's Representative. Exterior of tree shotcrete shall slope inwards to simulate base of tree trunk. See detail.
  - d. Base of tree shotcrete with tree surface shall extend below finish grade 9-inches min., to meet concrete base/footing.
2. Mockup shall show sample of each type of joint, including where shotcrete placements from different times meet in installation. Joints shall be made to appear as part of the surface texture of the Infinity Tree. Straight-line joints will not be approved, except for the horizontal joints where shotcrete work meets the concrete footing/base, and where the shotcrete work meets the wood portions of the Infinity Tree.
3. Location of mockup shall be approved by Owner's Representative, prior to installation.
4. Approvals:
  - a. Mockups that are not approved shall be removed from the site and disposed of in a legal manner.
  - b. Mockups that are approved, but which the Owner's Representative deems no longer needed by the project or the Client, shall be removed from the site and disposed of in a legal manner.

c. Approved mockup may be used as part of finished Infinity Tree, if method, timing, and process are approved prior to beginning of mockup placement. If such approval is granted, Infinity Tree's Base and Footing must be in place and approved, prior to placement of mockup. Approved mockup may become a part of the work if undamaged at time of Substantial Completion.

D. Design Mixes: For each shotcrete mix.

E. Qualification Data: For Installer.

1. Submit in accord with the Quality Assurance article.

F. Material Test Reports: For shotcrete materials.

G. Material Certificates: For each material item, signed by manufacturers.

H. Warranty and Special Warranty: Submit Shotcrete applicator's warranty for the bonding of layered finish shotcrete over structural shotcrete base.

1. Warranty shall be for 2 years from date of Substantial Completion.

I. Color pigments: Submit product data and application procedures.

1. Colors shall be as required to provide the appearance as approved by the Owner's Representative.

#### 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, and acceptable to authorities having jurisdiction.

B. Comply with provisions of the following, unless more stringent requirements are indicated:

1. ACI 301, "Specifications for Structural Concrete."
2. ACI 506.2, "Specification for Shotcrete."
3. CRSI's "Manual of Standard Practice."

C. Preinstallation Conference: Conduct conference at Project Site, prior to the start of construction. Review at least the following assumptions with Owner's Representative: Egress and ingress route, existing tree preservation, and placement of equipment required at different stages of project installation: location(s) of mockups; location of excavation for concrete base/footing; location of spoils placement during construction.

a. no impact to the cost of the Work resulting from these modifications.

#### 1.6 PROJECT CONDITIONS

A. Cold-Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1 and as follows:

1. Discontinue shotcreting when ambient temperature is 40 deg F and falling. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F and not more than 90 deg F.
  2. Do not use frozen materials or materials containing ice.
  3. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
  4. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
- B. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 305R when hot weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:
1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 90 deg F for wet mix.
  2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F before shotcreting.

#### 1.7 SURVEYING

- A. General: The Contractor will provide surveying for layout as frequently as is required to accurately locate all shotcrete walls. Confirm locations, elevations and profile of work in progress or completed work by surveying regularly. Provide survey notes from a registered surveyor at the request of the Owner.
- B. Tolerance: Tolerance for location of any point on the walls or stream defined on the drawing is 2 inches horizontal and .5-inch vertical dimensions.

#### 1.8 PHOTOGRAPHS

- A. Infinity Tree: Photographs of sequoia tree bark displaying intended shapes, colors, forms and textures of the shotcrete work are included in this specification for the Contractor's reference. Photographs, drawings and the sample panels will form the comparative standard for the work executed.
1. See also 3.1.A. of this section of the specifications.

#### 1.9 OWNERS'S REPRESENTATIVE'S OBSERVATION:

- A. It is intended that the configuration, texturing and coloring of exposed shotcrete surfaces be executed under the detailed observation of the Owner's Representative, at least until such times as satisfactory examples of the desired character have been developed. Notify the Owner's Representative at least seven (7) days before beginning placement of first example of each type of shotcrete to be exposed and schedule time when Owner's Representative can observe the finishing work as it is executed. Cooperate with the Owner's Representative in developing finishing techniques which will produce the required profiles, textures, colors and embedments. Correct work not approved by Owner's Representative at no cost to the Owner.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- A. Forms: Provide backing materials or utilize cut earth for backing to support the reinforcement during application of shotcrete. Form structural surfaces to the approximate profile of the finished shotcrete design appearance, and to provide for a finish coat as detailed. Furnish panels in largest practicable sizes to minimize number of joints.

### 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60 and Grade 40, deformed.
- B. Plain Steel Wire: ASTM A 82
- C. Plain-Steel-Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- D. Supports: Bolsters, chairs, spacers, ties, and other devices for spacing, supporting, and fastening reinforcing steel in place according to CRSI's "Manual of Standard Practice" and as follows:
- E. Reinforcing Anchors: ASTM A 36, unheaded rods or ASTM A 307, Grade A, hex-head bolts; carbon steel; and carbon-steel nuts.
  - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.

### 2.3 SHOTCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II. Use only one brand and type of cement for Project.
  - 1. Fly Ash: ASTM C 618, Class C or F.
  - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, from a single source.
  - 1. Aggregate Gradation: ACI 506R, Gradation No. 1 with 100% passing 3/8-inch (10mm) sieve.
  - 2. Coarse Aggregate Class: 3S.
  - 3. Membrane Broadcast Sand: Clean sharp sand.
- C. Integral Color Agent: ASTM C 979, synthetic mineral-oxide pigments or colored, water reducing admixtures, free of carbon black; color stable, nonfading, and resistant to lime and other alkalis.
  - 1. Color: As selected by Owner's Representative from manufacturer's full range.
    - a. Infinity Tree color to simulate color of natural tree bark from a Giant Sequoia.
  - 2. Approved Manufacturer:
    - a. Scofield 'Chromix' color admixtures, by Scofield Systems (1 (800) 800-9900), or approved equal.

- D. Water: Potable, complying with ASTM C 94, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.
- E. Paint and Stain: Acid stain (with latex paint added, if required), to achieve the approved appearance of each simulated material.
  - 1. Stain: "Lithochrome Chemstain Classic" by Scofield Systems (1 (800) 800-9900) or approved equal.
  - 2. Paint: Latex based commercial brand paint by Sherwin Williams or approved equal.
- F. Carbon-Steel Fiber: For shotcrete structural concrete coat only: ASTM C 1116, Type 3, carbon-steel fiber and ASTM A 820, Type 1, cold-drawn wire, not less than 1 inch (25mm) long.
- G. Synthetic Fiber: For shotcrete texture coat only: Fibrillated polypropylene fibers engineered and designed for use in shotcrete, complying with ASTM C 1116, Type III, not less than ¾ inch (19mm) long.
- H. Ground wire: High-strength steel wire, 0.8 to 1 mm in diameter.
- I. FRC Fiber-Reinforced Concrete: If needed for Tree at Hollows for Lights.

#### 2.4 CHEMICAL ADMIXTURES

- A. General: ASTM C 1141, Class A or B, but limited to the following admixture materials.
- B. Provide admixtures for shotcrete that contains not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.
  - 1. Air-Entraining Admixture: ASTM C 260.
  - 2. Water-Reducing Admixture: ASTM C 494, Type A.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  - 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
  - 5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  - 6. Accelerating Admixture: ASTM C 494, Type C.

#### 2.5 CURING MATERIALS

- A. General: Curing compound shall not alter the appearance of the approved finish.
  - 1. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
  - 2. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
  - 3. Water: Potable.
  - 4. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

## 2.6 SHOTCRETE MIXTURES, GENERAL

- A. Prepare design mixes for each type and strength of shotcrete.
  - 1. Limit use of fly ash, ground granulated blast-furnace slag, and silica fume to not exceed, in combination, 25 percent of Portland cement by weight.
- B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.
- C. Admixtures: When included in shotcrete design mixes, use admixtures and retarding admixtures according to manufacturer's written instructions.
- D. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

## 2.7 SHOTCRETE MIXTURES

- A. Proportion dry mixtures by field test data methods and wet mixtures according to ACI 211.1 and ACI 301, using materials to be used on Project, to provide shotcrete with the following properties:
  - 1. Normal-Weight Mixture Compressive Strength (28 Days): 5000 psi.

## 2.8 SHOTCRETE EQUIPMENT

- A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.
- B. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

## 2.9 BATCHING AND MIXING

- A. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94 and furnish batch ticket information.
- B. Dry-Mix Process: Comply with ASTM C 685 when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Examination: Before proceeding with shotcrete work, examine concrete footing/base of Infinity Tree for compliance with requirements for dimensional, grade, elevation tolerances, and reinforcing bars or other attachment hardware. Record conditions (photographs) and review conditions with Owner's Representative before beginning shotcrete operations.
- B. Concrete Base for Shotcrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and ½-inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.
  - 1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.
- C. Footings or Base: Clean surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding. If required, trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces before shotcreting.
- D. Proceed with shotcrete-related work only after unsatisfactory conditions have been corrected.

#### 3.2 FORMS

- A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
  - 1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
  - 2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.
- B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations, and accurately place and securely support items built into forms.

#### 3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.
- C. As required, locate and securely embed reinforcing anchors into existing substrates.
- D. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
- E. Place reinforcement to obtain appropriate coverage for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.
  - 1. To the maximum extent possible, hand bend all #4 and smaller reinforcement to be placed in walls that will be exposed to public view to ensure that the profile of the structural wall is formed to the approximate profile of the finished shotcrete simulated wood approved appearance.
    - a. The profile of the structural wall shall be hand formed to provide for a thickness of finished shotcrete top coat 2 inches thick unless otherwise indicated.
    - b. Factory pre-bent reinforcement shall not be placed in positions which alter the design intent of the finished surface; and, at the Owner's Representative's discretion, are subject to the Owner's Representative's field approval prior to shotcreting.
- F. Welded wire fabric may be installed as reinforcement at shotcrete contractor's discretion. 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.
  - 1. Position welded wire fabric to closely follow the reinforcement, allowing for the finish shotcrete thickness indicated on the construction documents.

### 3.4 JOINTS

- A. Joints in shotcrete work shall visually blend into the tree-like finish of the surface of the Infinity Tree. See
- B. Construction Joints: Locate per approval of Owner's Representative, and install joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints, unless otherwise indicated.
- C. Contraction Joints: Locate in shotcrete per approval of Owner's Representative using saw cuts 1/8-inch-wide-by-1/3 slab depth or joint-filler strips 1/4-inch-wide-by-1/3 shotcrete depth, unless otherwise indicated.
  - 1. After shotcrete has cured, remove strip inserts and clean groove of loose debris.
  - 2. Space joints at 15 feet O.C. maximum horizontally and vertically.
  - 3. Tool edges round on each side of strip inserts if floated or troweled finishes are required.

### 3.5 ALIGNMENT CONTROL

- A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces in which horizontal alignment is critical. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

### 3.6 PROVISIONS FOR OTHER ELEMENTS WITHIN THE WORK

- A. General:
  - 1. Provide openings in shotcrete formwork to accommodate all work of the project. Determine size and location of signs, openings, vents, weepholes, recesses, and similar items, before proceeding with the work.
  - 2. All sleeves and non-sleeved piping shall be installed as part of the work operations.
  - 3. Accurately place and securely support all items that are to be built into forms.

### 3.7 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Infinity Tree: Embed support rebar in concrete base/footing in coordination with Specialty Fabricator for secure tree installation.

### 3.8 APPLICATION

- A. Install and apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.
- B. Moisten wood forms, if utilized, immediately before placing shotcrete where form coatings are not used.
- C. Apply shotcrete according to ACI 506.2.
- D. Apply wet-mix shotcrete materials within 90 minutes after batching.
- E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.
  - 1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.
- F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent buildup against front face during shotcreting.

- G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.
- H. Do not permit shotcrete to sag, slough, or dislodge.
- I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.
- J. Do not disturb shotcrete surfaces before beginning finishing operations.
- K. Remove ground wires or other alignment control devices after shotcrete placement.
- L. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

### 3.9 SURFACE FINISHES

- A. See Section 1.4.C., of this section of the specifications.
  - 1. Apply stain (and paint if needed) as required for desired effect.
- B. Finishes: Nozzle applied in accord with ACI 506.2, within 90 minutes after batching. Finish types as shown in photograph (end of this specification section), on wood portions of Infinity Tree, and on drawings.
- C. Determination of Shotcrete Types: Finished product should appear as a cohesive natural formation. The following types of finishes will be produced:
  - 1. Infinity Tree: Texture to simulate color of natural tree bark from a Giant Sequoia. Texture to include integral color, surface staining and painting to match the surface of the Infinity Tree fabricated for this project, this site.

### 3.10 CURING

- A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.
- C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.
  - 2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

- a. Apply curing compound to natural- or gun-finished shotcrete at rate of 1 gal./100 sq. ft.
- D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

### 3.11 FORM REMOVAL

- A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 deg F for 24 consecutive hours after gunning, provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.
1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
  2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.
- B. Tests:
1. Test Panels: Reinforced cores; for each shotcrete mix.
  2. In-Place Shotcrete: A maximum of three unreinforced cores, taken from location approved by Owner's Representative.
  3. See section 3.13.B., of this section of the specifications.
- C. Owner's Representative's Direction:
1. It is intended that the configuration, texturing and coloring of exposed shotcrete surfaces be executed under the detailed direction of the Owner's Representative, at least until such times as satisfactory examples of the desired character have been developed. Notify the Owner's Representative at least seven (7) days before beginning placement of first example of each type of shotcrete to be exposed and schedule time when Owner's Representative can observe the finishing work as it is executed. Cooperate with the Owner's Representative in developing finishing techniques which will produce the required profiles, textures, colors and embedments. Correct work not approved by Owner's Representative at no cost to the Owner.

- D. Shotcrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and 1 test for each set of compressive-strength specimens.

### 3.13 REPAIRS

- A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.
  - 1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.
- B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

### 3.14 CLEANING

- A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

### 3.15 REPRESENTATIVE IMAGES

- A. The Contractor shall use the image on the following page, and the actual fabricated Infinity Tree, for reference during the execution of their work:



- END OF SECTION -

## SECTION 06 10 63 - EXTERIOR CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Custom pieces from Specialty Fabricator
- 2. Custom pieces from Artist and stored in City Corporation Yard

- B. Related Sections:

- 1. Section 03 37 13 – Shotcrete
- 2. Section 11 68 13 Play Equipment
- 3. Section 32 16 10 – Landscape Concrete
- 4. Section 32 18 16.13 Playground Protective Surfacing

- C. Scope of Work:

- 1. See drawings for additional detail including anticipated weights for custom fabricated elements.
- 2. Contractor shall coordinate, pick up from the specialty fabricator in Carlton, OR, and connect and install the following items that have been made by the Specialty Fabricator:
  - a. Custom Log Benches
  - b. Toadstool Steppers
  - c. "The A's Have It" Armature
  - d. Spirit Poles
  - e. Forest Library
  - f. Stump Armchair
  - g. Mailbox to Heaven
  - h. Entry Stump
  - i. Fallen Giants Log Climber
  - j. Infinity Tree – NOTE: Contractor shall construct shotcrete base; specialty fabricator to provide a template for top of shotcrete base to match base of Infinity Tree.
  - k. Lemon Love Stand
- 3. Contractor shall coordinate and pick up from the City of Forest Grove's Corporate Yard, and provide and install full assembly and construction of the following's responsibility to:
  - a. Woven Willow Fairy Houses

### 1.3 DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal (38 mm actual) in thickness and 2 inches nominal (38 mm actual) or greater width.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. WCLIB: West Coast Lumber Inspection Bureau.
  - 2. WWPA: Western Wood Products Association.

### 1.4 SUBMITTALS

- A. Product Data: For wood preservative products and metal framing anchors.
  - 1. For wood preservative product, contractor to provide recommendation for water-based, non-toxic wood preservative to be field applied, including manufacturer's written instructions for handling, storing, installing, and finishing treated material for approval.
  - 2. For fasteners, include installation instructions.

### 1.5 QUALITY ASSURANCE

- A. Forest Certification: Provide wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer.
  - 1. Contractor must be experienced installers of nature play areas. Submit a listing of at least three (3) installations where nature play elements similar to those proposed for use have been installed and have been in successful service for a minimum period of three (3) years. List shall include projects which require a similar level of complexity, eg. Curvilinear forms, number of cutouts, transitions, poles and other special requirements. This list shall include owner or purchaser; address of installation; service or maintenance organization; date of installation; contact person; and phone number of the contact person.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate pick-up or delivery of Specialty Fabricator pieces to coincide with timing of actual installation. Store Specialty Fabricator pieces under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation around individual pieces and under coverings.

## PART 2 - PRODUCTS

### 2.1 LUMBER, GENERAL

- A. Lumber: Comply with DOC PS 20 and with applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by ALSC's Board of Review. Provide lumber graded by an agency certified by ALSC's Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
  - 2. Provide dressed lumber, S4S, unless otherwise indicated.

### 2.2 DIMENSION LUMBER

- A. Maximum Moisture Content: 15 percent
- B. Exposed Lumber: Provide material hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- C. Dimension Lumber Posts: No. 2 Construction and of the following species:
  - 1. Western red cedar, WCLIB.
- D. Dimension Lumber Construction or No. 2 grade and any of the following species:
  - 1. Western red cedar, WCLIB.
  - 2. Redwood; RIS.

### 2.3 BOARDS

- A. Maximum Moisture Content: 15 percent.
- B. Provide boards hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

### 2.4 TIMBER

- A. Maximum Moisture Content: 19 percent.
- B. Dressing: Provide dressed timber (S4S) unless otherwise indicated.
- C. Timber Posts: Alaskan cedar; No. 2, WCLIB.

## 2.5 PRESERVATIVE TREATMENT

- A. After installation of specialty fabrication, contractor shall apply in the field a water based non-toxic wood preservative to all exposed wood members. Pressure treat poles with waterborne preservative to comply with AWPA C4.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Use stainless steel unless otherwise indicated.
  - 2. For pressure-preservative-treated wood, use stainless-steel fasteners.
- B. Nails: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Carbon-Steel Bolts: ASTM A 307 (ASTM F 568M) with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- G. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2 (ASTM F 738M, Grade A1 or A4); with ASTM F 594, Alloy Group 1 or 2 (ASTM F 836M, Grade A1 or A4) hex nuts and, where indicated, flat washers.
- H. Post-installed Anchors: Stainless-steel anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

## 2.7 CONCEALED FASTENERS

- 1. Submit type for approval, prior to construction.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to surface appearance or safety.
- B. Remove rough, sharp surfaces, and wood conditions that lead to splitting or splinters.

### 3.3 INSTALLATION OF SPECIALTY FABRICATION ITEMS

- A. Set exterior rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit exterior rough carpentry to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction" unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- H. Securely attach exterior carpentry work to substrate by anchoring and fastening as indicated.
- I. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.
- J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
- K. For Toadstool Steppers:
  - 1. Steppers will be similar to Toadstool Steppers, as shown on drawings.
  - 2. Obtain approval for layout of Steppers and pre-fabricated pieces from Owner's Representative prior to installation.

- L. For Woven Willow Fairy House (also known as Thicket)
  - a. Install Fairy House with integral floor over 4" concrete footing slab, size to match Fairy House floor. Concrete footing slab shall be 2800psi-strength, placed over plastic vapor barrier. Install No. 3 steel reinforcing bars centered in concrete footing slab, at 12" O.C., each way.
  - b. Vapor barrier shall be more than 10 mils thick, installed over 4" of Class II aggregate base, compacted to 95% minimum, over subgrade compacted to 90% minimum.
  - c. Floor of Fairy House shall be flush with concrete "porch", which shall be installed where shown on drawings, adjacent to Fairy House. Concrete minimum depth, reinforcing, aggregate base, and subgrade to match concrete footing slab. Slope "porch" away from floor at 1.5%, typ. For minimum of 4' distance from edge of floor. Install expansion joint at junction with Fairy House floor and footing slab.

- END OF SECTION -

## SECTION 11 68 00 – PLAY EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Provide and install freestanding playground equipment and structures; see drawings for clarification on base bid and add alt items:
    - a. Imbarimba
    - b. Lilypad Cymbals
    - c. Babel Drums
    - d. 2-Bay Swing Set
    - e. Parkour Climber
    - f. Spinner Bowls
    - g. Integration Carousel
    - h. Steel Frame Fairy House
    - i. Grab Rail at transfer locations
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures." Custom wood and play components
  - 2. Division 6 Section "Exterior Carpentry" for custom wood play components
  - 3. Division 32 Section "Landscape Concrete" for concrete reinforcement and footings
  - 4. Division 32 Section "Playground Protective Surfacing" for protective surfacing under and around playground equipment.

#### 1.3 DEFINITIONS

- A. Fall Height: According to ASTM F 1487, "the vertical distance between a designated play surface and the protective surfacing beneath it."
- B. HDPE: High-density polyethylene.
- C. IPEMA: International Play Equipment Manufacturers Association.
- D. LLDPE: Linear low-density polyethylene.

- E. MDPE: Medium-density polyethylene.
- F. Use Zone: According to ASTM F 1487, "the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Safety
  - 1. Playground equipment, including specialty concrete and/or wood play sculptures, shall meet the safety requirements of CPSC and ASTM F 1487 and Title 22. Social Security; Division 4. Environmental Health; Chapter 22. Safety Regulations for Playgrounds.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated submit two bound copies of play equipment product data, catalog cuts, photo brochures, specifications, and installation procedures, (including diagrams, instructions, scale models) or other printed information in sufficient detail and scope to verify compliance with requirements of the contract documents
- B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Extent of surface systems and use zones for equipment.
  - 2. Critical heights for playground surface or fall heights for equipment.
- C. Samples for Initial Selection: For each type of playground equipment and structure indicated, including accessories.
  - 1. Manufacturer's color charts.
  - 2. Include similar samples of playground equipment and accessories involving color selection.
- D. Product Certificates: For each type of playground equipment, signed by product manufacturer.
- E. Submit a statement by the material supplier or equipment manufacturer asserting that the supplied material or equipment meets and is installed according to the specified requirements.
- F. Provide a Certificate of Insurance from the manufacturer, covering both product and general liability, of not less than \$1,000,000. The issuing underwriter shall be AA rated.
- G. Maintenance Data: For playground equipment and finishes to include in Owner's maintenance manuals.

1. Submit two bound copies of procedures and instructions pertaining to frequency of preventive maintenance, inspection, adjustment, lubrication, and cleaning necessary to minimize corrective maintenance and repair for play equipment. A list of all parts and components for the system, by manufacturer's name, part number, and nomenclature, shall be attached.
  2. Supply a maintenance kit with each custom play structure that shall include wrenches for tamper-proof hardware, one (1) can of graffiti remover, primer, and spray paint to match the color of the structure, sandpaper, and a comprehensive maintenance manual. The maintenance manual shall include a complete plan drawing of the structure, inspection procedures, inspection report forms, and installation instructions and parts list. The entire kit is to be sent directly to the Owner's Representative.
- H. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- I. Provide evidence the installer of the play equipment possesses liability insurance of at least \$1,000,000 from a reputable insurance company covering defects in materials, workmanship, and installation. This liability shall cover any bodily harm resulting from a failure of play equipment due to installation defects.
- J. Qualification Data:
1. For Installer: Submit a listing of at least five installations where the brand of play equipment with similar units to those proposed has been installed and has been in successful service for at least five years. This list shall include owner or purchaser; address of installation; service or maintenance organization; date of installation; and contact person and phone number.
  2. For Manufacturer: Submit documentation that the Playground Equipment Manufacturer is ISO 9001 certified (Quality Management Standard) and ISO 14001 certified (Environmental Management Standard).
- K. Material Certificates: For the following items, signed by manufacturers:
1. Shop finishes.
  2. Recycled plastic.
- L. Field quality-control test reports.
- M. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for playground equipment.
- N. Warranty: Special warranty specified in this Section.
1. Provide manufacturer's standard warranty against all defects in materials and workmanship for the installed play equipment.
- O. Testing Agency Qualifications: Contractor shall provide an independent agency qualified according to ANSI Z34.1 for testing indicated.

1. Submit IPEMA certification showing compliance with all applicable portions of the current ASTM F-1487-01 Standard.
- P. Safety Standards: Provide playground equipment complying with or exceeding requirements in the following:
1. ASTM F 1487.
  2. CPSC No. 325.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Equipment shall be delivered and stored in accordance with the manufacturer's recommendations.
- 1.7 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace playground equipment components that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including chipping, breaking or bending of custom play nests.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. Play Equipment Warranty Period:
    - a. 3 YEAR LIMITED WARRANTY for all moving parts; swing seats and hangers; track ride trolleys and bumpers; spring assemblies for all rocking equipment and any other equipment not included above against failure due to corrosion, deterioration or workmanship.
    - b. 10 YEAR LIMITED WARRANTY for all aluminum; posts, clamps, beam, and caps, against structural failure due to corrosion, deterioration or workmanship. This warranty does not include any cosmetic issues.
    - c. 15 YEAR LIMITED WARRANTY for all plastic and steel components, against structural failure due to corrosion, deterioration or workmanship. This warranty does not include any cosmetic issues.
    - d. 15 YEAR LIMITED WARRANTY for protective plastic coating against structural failure due to corrosion, deterioration or workmanship. This warranty does not include any cosmetic issues.
  3. General Warranty:
    - a. Manufactured playground equipment shall be guaranteed against defects in workmanship, materials, or installation for a minimum period of one year after Substantial Completion. Warranty shall include but not be limited to such defects as bubbling, delamination, peeling, loss of integrity, poor ultraviolet stability, lack of permeability, or general deterioration due to weather. All posts shall be guaranteed against deterioration for ten

years. All rotationally molded components shall be guaranteed for five years.

## 1.8 SUBSTITUTIONS

- A. The specified play area equipment provides specific aesthetic character, play value and activities that contribute to the quality and purpose of the project design. Any equipment proposed for substitution shall match material, size, appearance and configuration, and shall provide the same range of activities and be appropriate for different physical skill and social levels within each play area, as intended by the specified equipment listed in these specifications or shown on the drawings.
- B. If playground equipment other than what is shown on the drawings is proposed, shop drawings shall be provided to illustrate how the playground design and layout is modified to accommodate equipment installation and use zones. Submit a detailed list of any deviations from the specified product.

## PART 2 - PRODUCTS

### 2.1 PLAYGROUND EQUIPMENT AND STRUCTURES

- A. Music Equipment
  - 1. Imbarimba
    - a. Provide and install Imbarimba as manufactured by Freenotes Harmony Park, or approved equal.
    - b. Use zone:
      - 1) None
    - c. Material:
      - 1) Per manufacturer.
      - 2) Install with in-ground mounting per manufacturer's recommendations.
    - d. Color: Standard
    - e. For Freenotes Harmony Park product information:
      - Wild Wood Playgrounds
      - Contact: Ben Lebwahl
      - Phone: (503) 288-5797
      - Email: [ben@wildwoodplaygrounds.com](mailto:ben@wildwoodplaygrounds.com)
      - Website: <https://freenotesharmonypark.com/products/instrument-collection/marimbas/imbarimba/>
  - 2. Lilypad Cymbals
    - a. Provide and install Lilypad Cymbals as manufactured by Freenotes Harmony Park, or approved equal.
    - b. Use zone:

- 1) none
      - c. Material:
        - 1) Per manufacturer.
        - 2) Install with in-ground mounting per manufacturer's recommendations.
      - d. Color: Standard
      - e. For Freenotes Harmony Park product information:
        - Wild Wood Playgrounds
        - Contact: Ben Lebwahl
        - Phone: (503) 288-5797
        - Email: [ben@wildwoodplaygrounds.com](mailto:ben@wildwoodplaygrounds.com)
        - Website: <https://freenotesharmoniypark.com/products/instrument-collection/bells/lilypad-cymbals/>
  - 3. Babel Drums (Large and Small)
    - a. Provide and install Large Babel Drum PPBDL-L and Small Babel Drum PPBDL-S, manufactured by Goric, or approved equal.
    - b. Use zone:
      - 1) none
    - c. Material
      - 1) Per manufacturer.
      - 2) Install with in-ground mounting per manufacturer's recommendations.
    - d. Color: Standard
    - e. For Goric products, contact:
      - Ryan Tompkins
      - Phone: 617-744-0772
      - E-mail: [ryan@goric.com](mailto:ryan@goric.com)
      - Website: <https://goric.com/products/babel-drum>
- B. Other Play Equipment
  - 1. Swings
    - a. Provide and install Robinia Wood Double-Bay Swing (NR0912) with One ADA 2-5 bucket seat, one ADA 5-12 bucket seat, and one Birds Nest Swing (SW990061 - 120cm) , or approved equal.
    - b. Use zone:
      - 1) Per manufacturer.
    - c. Material:
      - 1) Per manufacturer.
      - 2) Install with in-ground mounting per manufacturer's recommendations.
    - d. Color: Robinia wood Natural finish. Ropes: Black (standard). Birds Nest Swing: Green. ADA Bucket Swings: Spring Green.
    - e. For Kompan products contact:
      - Eric Wride
      - Phone: 503-707-5050
      - E-mail: [USSales@kompan.com](mailto:USSales@kompan.com)

Website: <https://www.kompan.us/play/nature-play/robinia-swings/double-swing-combination-with-bird-s-nest>

2. Parkour Climber
  - a. Install and provide Parkour 004, NRO854, manufactured by Kompan, or approved equal.
  - b. Use zone:
    - 1) Per manufacturer.
  - c. Material:
    - 1) Robinia Wood, per manufacturer.
    - 2) Install with in-ground mounting per manufacturer's recommendations.
  - d. Color: Robinia Wood Natural finish. Ropes: Black (standard).
  - e. For Kompan products contact:

Eric Wride  
Phone: 503-707-5050  
E-mail: [USSales@kompan.com](mailto:USSales@kompan.com)  
Website: <https://www.kompan.us/play/nature-play/robinia-obstacle-courses/parkour-004>
3. Spinner Bowls
  - a. Install and provide Spinner Bowl ELE400024 3717LG, manufactured by Kompan, or approved equal.
  - b. Use zone:
    - 1) 13'-9" x 13'-9" minimum
  - c. Material:
    - 1) Per manufacturer.
    - 2) Install with in-ground mounting per manufacturer's recommendations.
  - d. Color: Lime Green
  - e. For Kompan products contact:

Eric Wride  
Phone: 503-707-5050  
E-mail: [USSales@kompan.com](mailto:USSales@kompan.com)  
Website: <https://www.kompan.us/play/freestanding/supernova-carousels-spinners/spinner-bowl>
4. Integration Carousel
  - a. Install and provide We-Go-Round #24881A, manufactured by Goric, or approved equal.
  - b. Use zone: 20'-10" x 20'-10"
  - c. Material:
    - 1) Per manufacturer.
    - 2) Install with in-ground mounting per manufacturer's recommendations.
  - d. Color: Gray.
  - e. For Landscape Structures products contact:

Len Fransen  
Ross Recreation Equipment

Phone: 503-407-4890  
E-mail: [lenf@rossrec.com](mailto:lenf@rossrec.com)

5. Steel Frame Fairy Houses
    - a. Install custom steel frame structure, as shown on the drawings.
    - b. Submit shop drawings for approval, prior to fabrication, showing, but not limited to, materials, connections, welds, finishes, and dimensions.
    - c. Obtain approval for layout of footings, from Owner's Representative prior to installation.
    - d. Powder Coat color: RAL 7022.
  6. Fallen Giants Log Climber
    - a. Install pre-fabricated pieces, as shown on the drawings.
    - b. Major log elements will be Owner Supplied/Contractor Installed.
- C. Play Equipment Accessories
1. Grab Bar at Transfer Platform
    - a. Install GBS-1-14-SS 1-1/4" Diameter Straight Stainless Steel Grab Bar, , or approved equal, at locations shown on the drawings.
    - b. Install with wing-it type fasteners, or as recommended by manufacturer.
    - c. Install on 3"x3" stainless steel (Type 316) post.
      - 1) Post shall be stainless steel structural square tubing, with matching material cap at top.
      - 2) Install post in concrete footing, 12" diameter, 3'-6" deep. Extend post to 3" short of footing depth.
      - 3) Grind all welds smooth, finish with polyester powder-coating. Color: Black.
    - d. Submit shop drawings, for approval, prior to fabrication, showing, but not limited to, materials, connections, welds, finishes, and dimensions.
    - e. Obtain approval for layout from Owner's Representative prior to installation.

## 2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  1. Cast aluminum: ASTM B 179
- B. Steel: Comply with the following:
  1. Steel Plates, Shapes, and Bars: ASTM A 36, hot-dip galvanized.
  2. Steel Pipe: ASTM A 53 or ASTM A 135, standard-weight, hot-dip galvanized.
  3. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed, hot-dip galvanized.
- C. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666; Type 304.

- D. Fittings: ASTM A 467, Class CS, 4/0 or 5/0, commercial-quality, hot-dip galvanized steel connectors and swing or ring hangars.
- E. Castings and Hangers: Malleable iron, ASTM A 47, Grade 32510, hot-dip galvanized.
- F. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a secure and vandal-resistant design.
- G. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped, and theft resistant.
- H. Opaque Plastic: Color impregnated, UV stabilized, and mold resistant.
  - 1. Polyethylene: Fabricated from 96 percent recycled, purified, fractional-melt plastic resin; rotationally molded HDPE, LLDPE, or MDPE with not less than 1/4-inch wall thickness.
- I. Rotationally Molded Poly Parts: These parts shall be molded using prime compounded linear low-density polyethylene with a tensile strength of 2500 psi per ASTM D 638 and with color and UV stabilizing additives. Wall thickness varies by product from .187 inches (3/16 inch) to .312 inches (5/16 inch). Color shall be specified (four standard colors are available).
- J. Permalene Parts: These parts shall be manufactured from .75 inches thick high-density polyethylene that has been specially formulated for optimum UV stability and color retention. Compression-molded products shall meet or exceed density of .933 G/cc per ASTM D 1505, tensile strength of 2400 psi per ASTM D 638. Color shall be specified (standard solid colors are tan, red, blue, green, and yellow). Some Permalene parts are available in two-color laminate product with (2) .070 inches thick exterior layers over a .610 inches interior core of contrasting color. Color shall be specified (eight standard two-color options are available).
- K. Custom Components: These parts shall be manufactured in sizes and shapes as shown on the drawings and as required to complete the play equipment layout. Custom components shall meet or exceed ASTM standards as set forth in the General Requirements section. All custom components must be approved by the Owner's Representative.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and sub-grade drainage, and other conditions affecting performance.

1. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Owner's Representative.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prior to start of excavation, Contractor shall lay out the outdoor play areas and stake location of all elements, including playground equipment, use zones, pathways, planters, and hard surfaces based on actual playground equipment supplied to be installed. Use zones shall not overlap hard surfaces, and shall meet criteria of CPSC, ASTM F 1292-99, and ASTM F 1487-98. The City Representative reserves the right to adjust the equipment locations and other elements to meet field conditions and use zone safety requirements.

### 3.3 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
  1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. For the purpose of meeting the impact attenuation requirements of the playground safety surface in accordance with ASTM F1292 and Section 321816.13 PLAYGROUND PROTECTIVE SURFACES, the maximum accessible height of playground equipment shall be as specified by the manufacturer. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Playground Equipment Manufacturer's Services
  1. A manufacturer's representative who is experienced in the installation, adjustment, and operation of the playground equipment shall be on-site during installation. Manufacturer's certified installer shall be acceptable to meet this requirement. The representative shall supervise the installation and adjustment of the playground equipment to ensure that the equipment meets the requirements of CPSC and ASTM F 1487. The manufacturer shall select and approve the FACTORY CERTIFIED INSTALLER (submit proof of certification with bid)
- C. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted sub-grade soil.
- D. Post Set on Sub-grade: Level bearing surfaces with drainage fill to required elevation.

- E. Post Set with Concrete Footing: Comply with ACI 301 for measuring, batching, mixing, transporting, forming, and placing concrete.
  - 1. Set equipment posts in on concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
    - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
  - 2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.
  - 3. Concrete Footings: Smooth top, and shape to shed water.

#### 3.4 PLAY AREA LAYOUT REVISIONS

- A. The play area equipment layout, as shown on the Drawings, is based on the use of specific equipment designed for specific aesthetic character, play value and activities. The use of other equipment suppliers with different configurations, if approved, will require the Contractor to provide a revised play equipment layout and obtain approval of both the equipment and the play area layout from the City Representative. Contractor shall be responsible for all costs to revise the layout including review of the layout and documentation of the revised layout by City's consultant. The revised play equipment layout shall include appropriate safety use zone clearances for the equipment selected.

#### 3.5 LEVEL OF SAFETY SURFACING

- A. All play equipment located in areas of sand, wood fiber, or other loose fill surfacing shall be clearly marked to indicate the finished level of safety surfacing material to meet impact-attenuating requirements. All metal posts, springs or supports shall be as marked by the manufacturer. Those items not marked by the manufacturer shall be marked with a 3/4" circle painted with black epoxy paint.

#### 3.6 FIELD QUALITY CONTROL

- A. Arrange for playground equipment manufacturer's technical personnel to inspect playground and playground equipment and components during installation and at final completion and to certify compliance with the following:
  - 1. ASTM F 1487.
  - 2. CPSC No. 325.
- B. Notify the Owner at least 48 hours in advance of date and time of final inspection.

END OF SECTION 11 68 00

## SECTION 13 34 00 – FABRICATED ENGINEERED STRUCTURES

### PART 1 - GENERAL

#### 1.1 SCOPE

This specification covers:

1. Assembly and installation of picnic shelter.

#### 1.2 MANUFACTURER (or approved equal)

Natural Structures

P.O. Box 270

Baker City OR 97814

Toll Free: (800) 252-8475

Phone: (541) 523-0224

Fax: (541) 523-0231

E-mail: [info@naturalstructures.com](mailto:info@naturalstructures.com)

Contact: Chad Colton

#### 1.3 DESIGN CRITERIA

The Rocky Mountain 20' x 24' Shelter from Natural Structures, Inc. has been designed to individually meet the following criteria. Calculations and Engineer's stamped drawings are available, for standard buildings, upon request by the customer and are for their sole and specific use only. The design criteria are to ensure that the shelter not only will withstand the forces of nature listed below but to provide protection from vandalism and other unforeseen hazards.

##### A. Minimum Design Parameters

1. Wind Load: 90 mph class C
2. Snow Load: 30 psf
3. Seismic Load: Varies, meets local code requirements
4. Basic Soil Bearing: 1500 psf
5. Concrete Bearing: 2500 psi
6. Roof construction carries an ULC (uplift) rating of not less than Class 90

##### B. Maximum Design Parameters

1. Wind Load: up to 175 mph
2. Snow Load: up to 300 psf

#### 1.4 SPECIFICATIONS

##### A. Roof Pitch

1. 6/12 standard

##### B. Roof Style

1. Gable
2. Non bird nesting design
3. Metal roof color: Dark Bronze

C. Steel Posts

1. 6x6 by 3/16 steel tube (A 500 Grade B) with welded anchor and beam attachment plates.
2. All top plates, base plates, and wing plates conform to ASTM A36 Steel Plate.
3. Standard colors

D. Steel Truss Beams

1. 10x4 by 3/16 steel tube
2. All top plates, base plates, and wing plates conform to ASTM A36 Steel Plate.
3. Standard color: Kodiak

E. Steel Ridge Beams

1. 8x4 by 3/16 steel tube
2. All top plates, base plates, and wing plates conform to ASTM A36 Steel Plate.
3. Standard color: Kodiak

F. Purlins

1. 8x4 by 3/16 steel tube
2. All top plates, base plates, and wing plates conform to ASTM A36 Steel Plate.

G. Fascia

1. 2x6 Fir #1 or better; surfaced all four sides.

H. Roof Decking

1. 2x6 Fir select deck tongue and groove.
2. Decking shall be kiln dried to a moisture content of 19% or less and vee grooved on the finished face.
3. Decking is unfinished and requires on site cutting.
4. Pressure treating or staining is available.

I. Finish

1. Steel posts, beams and steel connections calibrated to SP 10 near white and electro statically polyester powder coated with a polyester powder coat to 6-8 mils.
2. Hardware is zinc coated or hot galvanized.
3. Any scratches or damage to paint to be touched up after final assembly.

J. Contractor shall include the following Options:

1. State Engineers Stamp and Signed and Sealed Drawings with Calcs – 5 copies
2. Stain or Clear Coat Fascia and T&G decking (Olympic Sierra)

2.1 MATERIALS

1. Rocky Mountain Series Shelter, 20' x 24' (Model 98-R20024-8T SPSB) from Natural Structures, Inc. (or approved equal)

### PART 3 - INSTALLATION

#### 3.1 SCOPE OF WORK

Contractor shall procure and install picnic shelter, per manufacturer's recommendations.

#### 3.2 ACCESS TO SITE

Delivery to site made on normal highway trucks and trailers. If at the time of delivery conditions of access are hazardous or unsuitable for truck and equipment due to weather, physical constraints, roadway width or grade, Natural Structures (or manufacturer of approved equal) may require an alternate site with better access provided to ensure a safe and quality installation.

In any such case, additional costs for cranes, trucking, etc. will be the responsibility of the Contractor, and will be considered part of the work.

- END OF SECTION

## SECTION 31 10 00 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Clearing and grubbing.
  - 2. Stripping and stockpiling topsoil.
- B. Related Sections:
  - 1. Division 01 Section Temporary Tree and Plant Protection

#### 1.2 SUBMITTALS

- A. Product Data for each type of product indicated.

#### 1.3 MATERIAL OWNERSHIP

- A. Except for items and materials identified "for salvage" and any materials indicated to remain on Owner's property, all cleared materials shall become Contractor's property and shall be removed from Project site and disposed of properly.

#### 1.4 PROJECT CONDITIONS

- A. Traffic: minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from City of Forest Grove.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or City of Forest Grove.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as directed by the Owner's Representative.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and tree and vegetation-protection measures are in place.
- E. The following practices are prohibited within tree protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

#### 1.5 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter, sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
  1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain.
- C. Protect existing site improvements to remain from damage during construction.
  1. Restore damaged improvements to their original condition, as acceptable to Owner.

#### 3.2 UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  1. Notify Owner not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Owner's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

### 3.3 CLEARING AND GRUBBING

- A. Remove obstructions, shrubs, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
  1. Do not remove trees, shrubs, and other vegetation indicated to remain.
  2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
  3. Completely remove stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
  4. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

### 3.4 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

### 3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

- B. Remove slabs, paving, and curbs at existing full-depth joints unless indicated otherwise. Neatly saw-cut length of existing pavement to remain with vertical faces prior to removing existing pavement.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove unusable surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

## SECTION 31 20 00 - EARTH MOVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Preparing subgrades
2. Excavating and backfilling for buildings and structures.
3. Drainage course for pervious concrete slabs-on-grade.
4. Base course for concrete walks, pavements, and slabs-on-grade.
5. Base course for gravel road.
6. Drain Rock for play area and valve box base.
7. Excavating and backfilling for utility trenches.
8. Drainage fill for infiltration facilities.

#### 1.2 REFERENCES

- A. Clean Water Services Design and Construction Standards R&O 17-05, Current Edition for Storm and Sanitary infrastructure.
- B. Clean Water Services Erosion Prevention and Sediment Control Manual, December 2008, for all Construction Erosion Control activities.
- C. City of Forest Grove Construction Standards, Current Edition, for all activities not governed by Clean Water Services.
- D. Washington County Road Design and Construction Standards, Current Edition, for all activities not governed by Clean Water Services or City of Forest Grove design standards.
- E. Oregon Department of Transportation, Oregon Standards Specifications for Construction, 2018, as referenced.

#### 1.3 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
- B. Base Course: Course placed between the subgrade and concrete paving to the depth identified in the plans and/or specifications.
- C. Bedding Course: Course placed in the trench around (both above and below) the utility pipe to the depth identified in the plans and/or specifications
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner's Representative. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner's Representative. Unauthorized excavation, as well as remedial work directed by Owner's Representative, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Structures: Buildings, foundations, slabs, curbs, or other man-made stationary features constructed above or below the ground surface.
- H. Subgrade: Surface or elevation remaining after completing excavation, or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

#### 1.4 PROJECT CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- B. Site Information: Research public utility records and verify existing utility locations prior to ordering any material. Notify the Owner's Representative immediately if any discrepancies are found in the project survey.

### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Base Course: Washington County Road Design and Construction Standards 1-inch minus.
- D. Bedding Course:

1. For Stormwater Conveyance Systems: Use Oregon Standard Specifications for Construction ¾-0 inch base aggregate.

E. Backfill and Fill:

1. Satisfactory soil materials
2. Stormwater Initial trench backfill: Use Oregon Standard Specifications for Construction ¾-0 inch base aggregate.
3. Water Initial trench backfill: Use Oregon Standard Specifications for Construction Class C Sand.

F. Raingarden:

1. Drain rock:
  - a. 3-inch depth choker course ¾-inch to ¼-inch clean crushed gravel with less than three percent passing the U.S. No 200 sieve.
  - b. 9-inch depth drain layer 1½-inch to ¾-inch clean crushed drain rock with less than three percent passing the U.S. No 200 sieve.
2. Matting:
  - a. High density jute or coconut matting, natural color, 100% biodegradable with all-natural fibers.
  - b. Matting shall not contain plastic/poly netting.

- G. Stormwater trench backfill: Use Oregon Standard Specifications for Construction ¾-0-inch base aggregate

## 2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction or as follows:

1. Red: electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

- B. Tracer Wire: 12 AWG minimum solid copper insulated High Molecular Weight Polyethylene (HMW PE) tracer wire or approved equal. The tracer wire insulation shall be green for sewer pipe and blue for waterlines and be a minimum of 45 mil. thick. Joints or splices shall be waterproof. The wire shall be rated for 30 Volt.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations. Provide protective insulating materials as necessary.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Erosion and Sediment Control" during earth moving operations.
- D. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- E. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- F. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

#### 3.2 EXPLOSIVES

- 1. Explosives: Do not use explosives.

#### 3.3 EXCAVATION

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions without prior approval by the Owner's Representative.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

#### 3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: 6 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade and bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course. Hand excavate for bell of pipes.
  - 2. Excavate utility structures to provide 6 inches clearance (enlarge as needed) to allow for compaction of backfill material.

3.7 SUBGRADE INSPECTION

- A. Proof-roll subgrade with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Soft pockets and areas of excess yielding that have been identified shall be scarified and moistened or aerated or removed and replaced with suitable soil materials to the depth required. Re-compact and retest until specified compaction is obtained.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Representative, without additional compensation.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
- B. Store stockpiles of organic soil mix in a manner that prevents them from becoming wet from rain, stormwater runoff, or other sources of water, or contaminated by fine soil or other undesirable materials. All stockpiles of mixed soil material shall be protected and covered.

### 3.9 BACKFILLS AND FILLS

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

### 3.10 UTILITY TRENCH BEDDING

- A. Place bedding on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

### 3.11 UTILITY TRENCH BACKFILL

- A. Place and compact initial trench backfill material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- B. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- C. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- D. Install tracer wire in a continuous fashion above the utility in such a manner as to be able to properly trace utility lines without loss or deterioration of signal or without the transmitted

signal migrating off the tracer wire. Bring tracer wire to the surface at every box, vault, drainage structure, or manhole.

### 3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
  - 6. Under and around utility structures, use engineered fill.

### 3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

### 3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight.
  - 1. Under building structures, scarify and recompact per CXT Manufacturer recommendations.
  - 2. Under vehicularly loaded pavements, scarify and recompact top 12 inches of existing subgrade and to 95 percent and Base Course to 100 percent.
  - 3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 4. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

5. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

### 3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Except in ADA conditions as noted on plans, slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  1. Turf or Unpaved Areas: Plus or minus 1 inch.
  2. Walks: Plus or minus 1/2 inch.
  3. Pavements: Plus or minus 1/2 inch.

### 3.16 BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
  1. Shape base course to required crown elevations and cross-slope grades.
  2. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  3. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to COG Standard Specifications.

### 3.17 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor shall engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  1. Paved and building slab areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
  3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- D. With the approval of the Owner's Representative, proof-roll testing of subgrade and/or aggregate base may be substituted for other compaction testing.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.18 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- D. Weather permitting and as approved, stormwater infiltration facility plants shall be installed as soon as possible after placing and grading the growing media in order to minimize erosion and further compaction.

### 3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

- END OF SECTION -

## SECTION 31 25 00 – EROSION PREVENTION AND SEDIMENT CONTROL

### PART 1 GENERAL

#### 1.1 SUMMARY:

- A. This section includes the following:
1. Prevention of erosion due to construction activities.
  2. Prevention of sedimentation of storm and sanitary sewers due to construction activities.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of Clean Water Services(CWS) in accordance with the Erosion Prevention and Sediment Control Planning and Design Manual (CWS ECS Manual).
- B. Develop an Erosion Prevention and Sedimentation Control Plan (EPSC). The EPSC should include consideration of the following:
1. Timing – schedule work to minimize overall impacts
  2. Stage work – identify & process critical areas first
  3. Minimize disturbance – create buffers & reduce mass grading
  4. Pre-construction – during preliminary design & prior to on site grading activities
  5. Pictures/Video – documentation throughout the life of the project
- See Chapter 3: Erosion Control Planning of the CWS ESC Manual for additional information.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- D. Revisions to EPSC: Keep copies of all EPSC revisions on site. For any revisions to the EPSC, the Contractor shall:
- Submit EPSC revisions by email to the City when revisions to the EPSC are minimal and identify in the email the particular changes. Submit only portions of the EPSC that have changed.
  - Submit the revisions by redlining the copy of the original EPSC or drawings. Submit only drawings that have changes.
  - When the EPSC requires extensive revisions, submit the entire revised EPSC to the City.

- E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
- G. Inspections:
  - 1. Inspections must be conducted by a person who:
    - a. Is knowledgeable in the principle and practice of erosion and sediment controls, and
    - b. Possesses the skills to assess conditions at the construction site that could impact stormwater quality, and
    - c. Is knowledgeable in the correct installation of the erosion and sediment controls, and
    - d. Is able to assess the effectiveness of sediment and erosion control measures selected to control the quality of stormwater discharges from the construction activity.
  - 2. Visual monitoring requirement: all areas of the site disturbed by construction activity must be inspected to ensure that BMPs are in working order. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking as well as areas used for storage of materials that are exposed to precipitation for evidence of spillage or other potential to contaminate stormwater runoff. In addition, inspect all discharge points identified in the EPSC for evidence of or the potential for the discharge of pollutants, and to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to surface waters. Where discharge points are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable.
  - 3. All EPSC controls and practices must be inspected according to the following schedule:

Site Condition	Minimum Frequency
1. Active Period	Daily when stormwater runoff, including runoff from snowmelt, is occurring. At least once every two weeks, regardless of whether stormwater runoff is occurring.
2. Prior to the site becoming inactive or in anticipation of site inaccessibility	Once to ensure that erosion and sediment control measures are in working order. Any necessary

	maintenance and repair must be made prior to leaving the site.
3. Inactive periods greater than 14 consecutive calendar days	Once every 2 weeks.
4. Periods during which the site is inaccessible due to inclement weather	If practical, inspections must occur daily at a relevant and accessible discharge point or downstream location

4. Recordkeeping Requirements: Document all visual inspections in an onsite logbook. If there are no findings, simply record the inspection date, and inspector's name. In addition, record any findings, including:
- a. At the designated discharge location(s):
    - 1) Where to make observations:
      - a) At the discharge location if the discharge is to a conveyance system leading to surface waters;
      - b) From the discharge point to 50 feet downstream if the discharge is to surface waters; and
      - c) At any location where more than 1/2 of the width of the receiving surface water is affected.
    - 2) How to make observations:
      - a) For turbidity and color, describe any apparent color and the clarity of the discharge, and any apparent difference in comparison with surface waters.
      - b) Describe any sheen or floating material, or record that it is absent. If present, it could indicate concern about a possible spill or leakage from vehicles or materials storage.
  - b. If a site is inaccessible due to inclement weather, record the inspections noted at a relevant discharge point or downstream location, if practical.
  - c. Locations of BMPs that need to be maintained, inspections of all BMPs, including erosion and sediment controls, chemical and waste controls, locations where vehicles enter and exit the site, status of areas that employ temporary or final stabilization control, soil stockpile area, and non-stormwater pollution (e.g. paints, oils, fuels, adhesives) controls.
  - d. Locations of BMPs that failed to operate as designed or proved inadequate for a particular location;
  - e. Locations where additional BMPs are needed that did not exist at the time of inspection; and
  - f. Corrective action required and implementation dates.
  - g. All inspection records and monitoring results must be kept on site and maintained by the permit registrant. The records shall list the

construction site name as it appears on the registrant's permit and the file or site number. These records must be made available to DEQ, Agent, or local municipality upon request. These records must be delivered or made available to DEQ within 3 working days of request. These inspection records and monitoring results must be maintained for at least 3 years after project completion. In addition, a copy of the EPSC and revisions must be retained on site and made available on request to the DEQ, Agent, or the local municipality. During inactive periods of greater than 7 consecutive calendar days, the EPSC must be retained by the permit registrant but does not need to be at the construction site.

- h. If the BMPs approved in an EPSC plan are not effective or sufficient as determined by the inspector, the permittee shall submit a revised plan within three working days of written notification by the City. Upon approval of the revised plan, the permittee shall immediately implement the BMPs included in the revised plan.
  
  - H. Erosion On-Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
    - 1. Control movement of sediment and soil from temporary stockpiles of soil.
    - 2. Prevent development of ruts due to equipment and vehicular traffic.
    - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
  
  - I. Erosion Off-Site: Prevent erosion of soil and deposition of sediment on other properties due to construction activities for this project.
    - 1. Prevent windblown soil from leaving the project site.
    - 2. Prevent tracking of mud onto public roads outside site.
    - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
    - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
  
  - J. Sedimentation Off-Site: Prevent sedimentation of storm sewers, and sanitary sewers.
    - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  
  - K. Open Water: Prevent standing water that could become stagnant.
  
  - L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- 1.3 SUBMITTALS
- A. Product Data: For materials indicated in EPSC and additional materials included in EPSC revisions.

- B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; with the following properties:
  - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
  - 2. Permittivity:  $0.05 \text{ sec}^{-1}$ , minimum, when tested in accordance with ASTM D 4491.
  - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
  - 4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
  - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
  - 6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
  - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- B. Silt Fence Posts: One of the following, minimum 4 feet long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
  - 2. Softwood, 4 by 4 inches in cross-section.
  - 3. Hardwood, 2 by 2 inches in cross-section.
- C. Inlet protection: as shown on plans.
- D. Straw wattles: as shown on plans
- E. Construction Entrance: Per the Clean Water Services Erosion and Prevention Manual and as shown on plans.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface of clean pit run rock.
  - 1. Width: As required; twenty (20) feet, minimum.
  - 2. Length: fifty (50) feet, minimum.
  - 3. Provide at each construction entrance from public right-of-way.
  - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Silt Fences.
  - 1. Provide Silt fences:
    - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
  - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
    - a. Slope of Less Than 2 Percent: 100 feet.
    - b. Slope Between 2 and 5 Percent: 75 feet.
    - c. Slope Between 5 and 10 Percent: 50 feet.
    - d. Slope Between 10 and 20 Percent: 25 feet.
    - e. Slope Over 20 Percent: 15 feet.
- D. Inlet Protection Filter Sack: Protect each inlet using the following measures:
  - 1. Woven fabric bag insert set beneath inlet grate.
  - 2. Bio-filtration bags blocking entire inlet face area.
- E. Soil Stockpiles: Protect using one of the following measures:
  - 1. Cover with polyethylene film, secured by placing soil or sand bags on outer edges.
  - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves; or, 6 inches of straw or hay;
    - a. as approved by Owner's Representative.
- F. Temporary Seeding: Use where temporary vegetated cover is required.

- G. Straw Wattles: Use to prevent sediment laden water and erosive flows on unstabilized slopes.

### 3.4 INSTALLATION

#### A. Construction Entrance and Tire Wash:

1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.
4. Provide tire wash basin/sump per CWS.

#### B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Use nominal 36 inch high barriers with minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
3. Install with top of fabric at nominal height and embedment as specified.
4. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
5. Fasten fabric to wood posts using one of the following:
  - a. Integral pockets.
  - b. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
  - c. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.
6. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
7. Wherever runoff will flow around end of barrier, provide temporary splash pad or other outlet protection.

#### C. Inlet Protection Filter Sack:

1. Install per manufacturer's recommendations.

#### D. Straw Wattles:

1. Install per manufacturer's recommendations and per the approved EPSC.

### 3.5 MAINTENANCE

- A. Inspect preventive measures routinely (daily), within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:

1. Promptly replace fabric that deteriorates unless need for fence has passed.
  2. Remove silt deposits that exceed one-third of the height of the fence.
  3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Inlet Protection Filter Sacks
1. Promptly replace sacks that are damaged or deteriorated unless the need has passed.
  2. Remove silt deposits that exceed the containment area of the sack.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.
- G. Concrete Wash-out Container: Properly call container provider to pick up pan when full and replace with empty pan or properly dispose of concrete waste material. Concrete waste to be recycled by container provider.

### 3.6 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Owners Representative.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

- END OF SECTION -

## SECTION 32 15 40 – STABILIZED DECOMPOSED GRANITE PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Decomposed granite paving with organic binder to create a firm, stable, and slip resistant surface (see Section 2.1, C below). Basis of design: Organic-Lock stabilizer.
  - 2. Metal Edge Restraints. Basis of design: Col-Met steel edging.
- B. Related Sections:
  - 1. See 31 20 00 Earth Moving
  - 2. See 32 16 10 Landscape Concrete

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Perform gradation of 1/4" minus decomposed granite material in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Course.

#### 1.3 REFERENCES

- A. ASTM C136 / C136M – 14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates, ASTM International, West Conshohocken, PA, 2014, [www.astm.org](http://www.astm.org)
- B. ASTM D2419 – 14, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregates, ASTM International, West Conshohocken, PA, 2014, [www.astm.org](http://www.astm.org)
- C. ASTM F1951 – 14, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment, ASTM International, West Conshohocken, PA, 2014, [www.astm.org](http://www.astm.org)

#### 1.3 SUBMITTALS

- A. Product Data: For each product specified. Submit a 5 lb. sample and sieve analysis for grading of 1/4" minus decomposed granite to be sent to Owner's Representative prior to any construction (allow 3-week turn around). Sample must be approved by Owner's Representative.

#### 1.4 PROJECT/SITE CONDITIONS

- A. Field Measurements: Each bidder is required to visit the site of the Work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.
  - 1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.
- B. Ensure that the subgrade and base are properly graded and compacted to required specifications.
- C. Do not install during rain. Rain within 3-5 days after installation will increase curing time.
- D. Protect all nearby surfaces, plants, and structures from possible contamination from materials or damage by equipment.
- E. It is not recommended to install when temperatures are below 40 degrees Fahrenheit (5 degrees Celsius).

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Build a mockup for approval by the Owner's Representative for the following: Stabilized decomposed granite paving, minimum 4' x 4' size with steel edge restraints. Sample must provide a firm and stable surface without rutting of surface when tested with a loaded wheelchair. Approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, HANDLING, AND STORAGE

- A. Delivery:
  - 1. Delivery of Organic-Lock is available from the manufacturer or select Organic-Lock dealers. Contact the manufacturer for more information.
- B. Handling:
  - 1. When dealing with un-blended Organic-Lock, wear appropriate respirator when ventilation is inadequate. Avoid contact with skin and eyes.
- C. Storage:
  - 1. Protect stabilized crushed aggregate mix from contamination. Store undercover. If the blended and hydrated aggregate is sitting for long periods of time (longer than 48 hours), or when subject to rainfall, it needs to be turned with a skid steerer or loader to ensure consistent moisture content throughout prior to installation. Verify hydration level with snowball test before installation. For any questions regarding storage, contact the manufacturer or local dealer.

1.7 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: Submit a written warranty executed by the installer agreeing to repair or replace components of stabilized surfacing that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
  - 1. Premature wear and tear provided the material is maintained in accordance with manufacturer's written maintenance instructions.
  - 2. Failure of system to meet performance requirements.
- C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.
- D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required, as part of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Organic-Lock for Organic-Lock stabilized pathway aggregate. Organic-Lock is provided by:

Envirobond Products Corporation  
6191-2100 Bloor Street West  
Toronto, Ontario, Canada  
M6S 5A5  
1-866-636-8476  
info@envirobond.com  
www.envirobond.com  
www.organic-lock.com

- B. Basis of Design: Col-Met Steel Edging  
Collier Metal Specialties  
3333 Miller Park South  
Garland, TX 75042  
1(972) 494-3900  
[sales@colmet.com](mailto:sales@colmet.com)

## 2.2 MATERIALS

### A. Crushed Aggregate Materials:

1. Crushed Aggregate Material shall consist of sound, angular, durable particles.
2. Gradation, in accordance with ASTM C136:

Optimal Gradation		
Sieve	Sieve Size (mm)	Percent Passing
4	4.75	80% - 100%
8	2.36	65% - 90%
16	1.18	40% - 65%
30	0.6	25% - 55%
50	0.3	15% - 35%
100	0.15	10% - 20%
200	0.075	5% - 15%

### A. Organic-Lock Binder

1. Patented powdered organic binder designed to be blended with crushed aggregate.
2. Made from 100% naturally occurring materials.

### B. Col-Met steel edging

- a. Height: 6inch; Thickness: 0.125inch
- b. Manufactured from Hot Rolled Steel. (ASTMA366).
- c. Powder Coat Color: Black
- d. Tapered Stakes: 10ga. X 16"

### C. Geo-Textile Fabric

- a. Per recommendations of Organic-Lock manufacturer.

## 2.3 EXCESS MATERIALS

- B. Provide Owner's Representative with the following excess materials for use in future paving repair: three 40 to 50 lb. Bags of the stone paving blended with proper amount of stabilizer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare subgrades such that they are rough-graded and compacted to minimum 95% compaction. Verify that adjacent paving has been installed and accepted prior to commencement of work.

- B. Prepare proper hydration of the Organic-Lock blended aggregate (important to the longevity of the surface). The instructions below refer to Organic-Lock that has been pre-blended with aggregate and contains optimal moisture content. For more information on pre-wetting, and pre-blending Organic-Lock refer to installation guideline video [https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg\\_K6VCTUWAuep3zDg\\_0yCv&index=6&t=40s](https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=40s)
1. Installing Organic-Lock blended aggregate in dry conditions and temperatures above 40° Fahrenheit (5° Celsius). Both wet and cold conditions slow down the curing/drying process.

### 3.2 PREPARATION

#### 1. Prepare the Subgrade

Excavate the area to the depth required so that finish grade can be established as noted on plans.

Install with a full depth of 7-9 inches, consisting of 4-6 inches of compacted base depth together with 3 inches of compacted Organic-Lock Pathway Aggregate.

Compact the subgrade to 95% Modified Proctor Density.

#### 2. Prepare the Base

Install the base material as per State of Oregon DOT road base guidelines. Clear stone or ungraded base will not be acceptable. Compact the base to 95% modified proctor density.

Install with 4-6 inches of compacted base material.

Depending upon the method of compaction the installation of base material may require separate lifts. 4 inches can be compacted in a single lift with a minimum 2-ton compaction roller.

Compact the subgrade to 95% Modified Proctor Density using a single or double drum static roller or vibratory compactor.

### 3.3 WATERSHED MANAGEMENT

Incorporate crowns and/or cross-slopes into the compacted base material.

Where slopes are 2% or lower, incorporate crown into the pathway.  
Where slopes are greater than 2%, incorporate cross-slopes.

### 3.4 SPREADING

The use of a paving machine is highly recommended for large projects to evenly spread Organic-Lock Pathway Aggregate at the specified depth. It's recommended to screed the material to ensure the depth is consistent for smaller projects or projects with tight areas.

Spread the loose and uncompacted Organic-Lock Pathway Aggregate over the compacted base material.

Typically, a lift of 4 inches of loose, pre-wet Organic-Lock Pathway Aggregate will compact to the required 3-inch depth for Foot-Traffic Pathways.

### 3.5 COMPACTION

Make 4-6 passes using a 1-ton double or single static drum roller, or equivalent. A Foot-Traffic Pathway will typically require one lift, compacted to 3 inches.

Compaction will vary with different aggregates due to particle shape and size. It will compact 20-25%, less if using paving machinery. This level of compaction needs to be monitored as early as possible (starting during the test plot) to determine the actual degree of compaction. It is better to put down too much material and to remove it from the top than to put down too little and add a layer later.

Compact to 95% Modified Proctor Density.

Note: Vibratory compaction is acceptable for the base material but generally not suitable for Organic-Lock blended aggregate as it risks disassociating the bonds of the stabilized aggregate or allowing the fines and moisture to migrate to the surface, causing the surface to take on a smooth, concrete-like appearance. Organic-Lock Blended Aggregates should be compacted using a single or double drum static roller wherever possible. For tight spaces that are not accessible by drum rollers, a hand tamper is recommended. However, in certain circumstances, a vibratory or plate tamper can be used where the installer deems it to be more effective as hand-tamping over large spaces will create inconsistent results.

Provided the moisture content of the Organic-Lock blended aggregate is adequate, additional hydration should not be necessary. On dry, sunny days, however, the surface layer may start to dry out while installing, in which case, a light misting would be appropriate to prevent surface cracks from appearing during compaction. Refer to our installation guideline video [https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg\\_K6VCTUWAuep3zDg\\_0yCv&index=6&t=40s](https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=40s) for more information.

### 3.6 COMPLETING INSTALLATION

Apply a light spray to the surface of the material to give a clean appearance.

Apply water until the water begins to run-off.

Do not allow pedestrian or other traffic on the newly installed pathway until fully cured, a minimum of 24-72 hours.

### 3.7 REPAIRS AND PROTECTION

Excavate the damaged area and scarify exposed Organic-Lock Pathway Aggregate.

Pre-blend the replacement crushed stone aggregate material with Organic-Lock at 28-34 lbs / imperial ton. Apply the material to the excavated area and compact. Thoroughly water the material to achieve an 8-10% moisture content. Use the "snowball test" to determine moisture content - refer to [https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg\\_K6VCTUWAuep3zDg\\_0yCv&index=6&t=40s](https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=40s) for details.

Allow the newly installed Organic-Lock Pathway Aggregate to cure, but not completely dry out.

Re-compact the material, ensuring that the final grade and crown are maintained.

### 3.8 PLACEMENT

#### C. Edge Restraints

1. Install according to drawings. Lines shall be true, even curves. Layout and alignment shall be approved prior to placing decomposed granite. If paving operations distort the alignment, edge restraint shall be re-staked and surfacing re-compacted prior to final approval.

#### D. Filter Fabric:

1. Place geotextile filter fabric following preparation of subgrade surface.
2. Remove loose material from compacted subgrade surface immediately before placing geotextile filter fabric.
3. The geotextile shall be placed loosely with no wrinkles or folds, and with no void spaces between the geotextile and the ground surface. Successive sheets of geotextiles shall be overlapped a minimum of 300 mm (12 in), with the upstream sheet overlapping the downstream sheet.
4. Should the geotextile be damaged during installation, a geotextile patch shall be placed over the damaged area extending beyond the damaged area a distance of 300 mm (12 in), or the specified seam overlap, whichever is greater.

#### E. Stabilized Decomposed Granite:

1. Place the pre-blended Stabilized ¾" minus decomposed aggregate on prepared base. Install decomposed granite true to grade, properly coinciding with adjacent work and elevations. Do not permit finished work to vary more than ½ inch in 10 feet from true profile and cross section.
2. Depth of all areas shall be 4".

### 3.9 WATERING

Water heavily to achieve full depth moisture penetration of the stabilized paving profile. Water activates Stabilizer. To achieve saturation of stabilized paving profile, 25 to 45 gallons of water per 1-ton must be applied. During water application randomly test for depth using a probing device to the final depth.

### 3.10 COMPACTION

Upon thorough moisture penetration, compact aggregate screenings to 85% relative compaction by compaction equipment such as; a 2 to 4-ton double drum roller or a 1,000 lb. Single drum roller with vibratory plate tamp. Do not begin compaction for 6 hours after placement and up to 48 hours.

Take care in compacting  $\frac{1}{4}$ " minus decomposed granite when adjacent to planting and irrigation systems. Do not permit mixture to contaminate planting areas. Hand tamping with 8" or 10" hand tamp recommended. Clean up immediately all mixtures spilled on adjacent paving.

### 3.11 INSPECTION

Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material shall not be present on the surface. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

### 3.12 MAINTENANCE

Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade  $\frac{1}{4}$ " off the paving surface.

During the first year, a minor amount of loose stone will appear on the paving surface ( $\frac{1}{16}$ " to  $\frac{1}{4}$ "). If this material exceeds a  $\frac{1}{4}$ ", redistribute the material over the entire surface. Water thoroughly to the depth of 1". Compact with power roller of no less than 1000 lbs. This process should be repeated as needed.

If cracking occurs, simply sweep fines into the cracks, water thoroughly and hand tamp with an 8" – 10" hand tamp plate.

### 3.13 REPAIRS

Excavate damaged area to the depth of the Stabilized stone and square off sidewalls.

If area is dry, moisten damaged portion lightly.

Pre-blend the dry required amount of Stabilizer powder with the proper amount of stone in a concrete mixer.

Add water to the pre-blended stone and Stabilizer. Thoroughly moisten mix with 25 to 45 gallons per 1-ton of pre-blended material or to approximately 10% moisture content.

Apply moistened pre-blended stone to excavated area to finish grade.

Compact with an 8" to 10" hand tamp or 250 to 300-pound roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.

### 3.14 MAINTENANCE

All outdoor products require a level of maintenance analysis. It is recommended to do a thorough analysis of installed Organic-Lock blended aggregate 7 days after installation followed by monthly analysis to ensure no alterations are required.

#### Erosion Damage

The greatest element of concern is rainfall erosion. Often, this problem can be greatly reduced by adjusting the watershed areas surrounding the product itself. The best way to determine how the water is building up, is to examine project area during a rainstorm. Learning where the water is coming from can lead to water diverting that dramatically reduces the stress on the surface.

Installing culverts, drains, cross slopes, crowns, or diverters can limit the majority of stress causing damage.

Where erosion damage occurs, address the cause, then replace the lost material with new material following the guidelines below.

#### Excess Loose Material

Directly after the installation, the aggregate surface will be smooth because of the weight of the fresh compaction. As the surface weathers with traffic and time, the larger particles of the aggregate will loosen on the surface to create a natural look and feel. The loose aggregate particles on the surface should not exceed 1/4" in depth.

Sweeping off excess particles can be accomplished in areas where excess 1/4" chip is not detrimental. These loose particles can also be shoveled and removed from site. The remaining surface will eventually chip loose again, so new material is recommended as a top up (see instructions below) after doing this more than once.

If material exceeds a 1/4", redistribute the particles over a greater surface, scarify the surface to a depth of 1" and water to a 1" depth and compact with a roller of no less than 1000-lbs. Keep traffic off for 24-72 hours.

#### Removing Debris

Remove grass clippings, soil, debris or organic material by mechanically blowing or hand raking as needed.

#### Snow Plowing

When plowing snow, use a shoe lift or rubber baffle on the blade of the plow to lift the blade up 1/4" off the surface. Extra precautions should always be taken after the first snow and last snow of the season, as this is when the material is most prone (i.e. the ground is not frozen).

### 3.15 ADDING NEW BLENDED ORGANIC-LOCK BLENDED AGGREGATE MATERIAL TO DAMAGED AREAS

Below the loose surface particles, the firmed material should be stable to resist erosion and support the intended traffic.

If this lower level material incurs damage, we recommend the following:

#### Fixing Lightly Damaged Areas

Lightly damaged areas can be repaired by soaking, scarifying with a rake to 1-2 inches and compacting the scarified area using a roller or a hand tamper.

#### Adjusting Organic-Lock Blended Aggregate

The Organic-Lock gel activates each time it comes in contact with water, which allows for the blended aggregate to be physically broken up, re-worked and returned back to its initial state. This self-healing nature allows for a simplified maintenance procedure that leaves no sign of the maintenance itself.

For example:

Where necessary to install an irrigation line below finished pathway, add water, dig the material up, install irrigation line, spread the material back in place, then water and compact it using a roller or a hand tamper back to new.

#### Fixing Larger or More Severely Damaged Areas

Excavate the damaged area to a depth of 2" to an approximate 50% increase in area (i.e. if area is in a 4-foot radius circle, excavate a total of 6 feet in diameter).

Estimate amount of material lost or material needed to be topped up. Add this amount of preblended Organic-Lock aggregate in the area.

Blend this newly blended aggregate in by one of the following methods:

A. Rototill to a Depth of 2 Inches

Rototill with multiple passes and not exceeding the depth of the Organic-Lock blended aggregate (i.e. avoid disrupting the base material). Spray the surface with a light spray and begin to till this material to achieve a homogeneous blend of the new and existing material. Add further water while mixing to achieve the optimal snowball (as seen in the snowball test).

B. Remove and Blend the Material Off Site

Add the new Organic-Lock blended aggregate to the existing material on a clean pad. Using a front-end loader (or shovels for smaller projects) mechanically turn the material over until a homogeneous blend is achieved. Add water into mixture until achieving an optimal snowball (as seen in the snowball test).

Spread this newly blended material back into the area where the excavation was completed and compact using a roller or a hand tamper

Note: Maintenance or patching should not be compacted with a vibratory plate compactor, as it will rattle and damage the surrounding cured area.

- End of Section –

SECTION 32 16 10 – LANDSCAPE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Concrete Paving
- 2. Concrete Flush Curbs
- 3. Concrete Seatwalls
- 4. Concrete Footings

B. Related Sections include the following:

- 1. Section 03 37 13 - Shotcrete
- 2. Section 11 68 00 - Play Equipment
- 3. Section 32 33 00 - Site Furnishings
- 4. Section 13 34 00 – Fabricated Engineered Structures

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

- 1. Samples/Mockups - For each exposed product and for each color and texture specified:
  - a. A 3' by 3' sample shall be provided for approval by the Owner's Representative prior to mock-up of concrete work.
  - b. Install samples of concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
  - c. The Contractor shall notify the Owner's Representative 72 hours in advance of concrete sample installation. Field adjustments shall be made as directed by the Owner's Representative.
  - d. All approved samples shall be kept at the jobsite for comparison with finished work. Approved samples shall serve as standard for the color and finish for all subsequent concrete of that type, for the project.

- e. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner's Representative specifically approves such deviations in writing.
  - f. Contractor shall meet or exceed the quality of the approved finish in all subsequent work.
  - g. Contractor shall remove the samples at completion of the work.
  - h. Do not deliver product to job site until submittal has been approved.
- B. Joint sealant samples:
- 1. Submit to Owner's Representative manufacturer's literature, specification data, and color sample for all materials proposed for the project (see section 2.7A).
  - 2. Identify their use and location.
- C. Product Data for each type of joint indicated: Manufacturer's catalog sheets including instructions for use and description of application shall be provided for each type of product indicated, including each of the following materials:
- 1. Epoxies
  - 2. Grout
  - 3. Admixtures
  - 4. Curing Compounds
  - 5. Chemical Hardener
  - 6. Integral Colors
  - 7. Mix Designs
- D. Delivery Tickets: Submit delivery ticket (with copy for Contractor to keep) for each load of concrete delivered to the job, showing at least the following.
- 1. Date, Name of ready-mix plant, job location.
  - 2. Contractor, and full name of Contractor's representative receiving the concrete.
  - 3. Type, brand, of cement.
  - 4. Class and specified cement contents in bags per cubic yard of concrete.
  - 5. Truck number.
  - 6.
  - 7. Time of arrival, time of unloading.
  - 8. Admixtures, if any
  - 9. Maximum aggregate size and amount of aggregate of each size (per cubic yard)
  - 10. Water added at job, if any

#### 1.4 QUALITY ASSURANCE

A. Installer Qualifications:

- 1. Installer must demonstrate their previous experience in completing paving similar in type, scope and scale to the elements described in the drawings and herein.
- 2. Installer must demonstrate that they have successfully completed at least five (5) other installations for public use.

- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.
- D. Patching: Any surface requiring patching shall be reviewed with the Owner's Representative, prior to proceeding with the work, and shall be consistent and matching with the adjacent and surrounding surface in color and finish.
- E. Pre-installation Conference: Conduct conference at Project site with the Owner's Representative.
  - 1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:
    - a. Concrete mixture design.
    - b. Quality control of concrete materials and decorative concrete paving construction practices.
    - c. Mockup samples.
- F. Layout of the Work: Layout and establishment of lines, levels, grades, and positions of all items that include concrete shall be done by a licensed surveyor or registered civil engineer. Obtain approval of layout by Owner's Representative prior to installation.

## PART 2 - PRODUCTS

### 2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. The following list of materials
  - 1. Masonite, coated plywood, steel, or other suitable material may be used provided form does not imprint concrete with grain or pattern.
  - 2. Plywood shall be free from loose knots, holes, and other defects, grade B-B concrete form panels conforming to PS-1.
  - 3. Surfaces of steel forms shall be free from irregularities, dents, and sags.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

## 2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- F. Deformed-Steel Wire: ASTM A 496/A 496M.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

## 2.3 CONCRETE MATERIALS

- A. Mix Design: Mix designs shall be signed by a testing laboratory approved by the Owner's Representative. Each design shall be verified by tests on cylinders prior to placement of the concrete, and compression tests shall show values at least 25% greater than the minimum strength indicated or specified, per ACI Standards, at no additional cost to the project.
  - 1. Strength:
    - a. Paving, curbs, footings: 2,500psi min., at 28 days
      - 1) Slump: 4 in.
      - 2) Max. aggregate size: 3/4in.
      - 3) Min. Sacks of cement per cubic yard: 5.5
    - b. Walls: 3,000psi min., at 28 days
      - 1) Slump: 4 in.
      - 2) Max. aggregate size: 1in.
      - 3) Min. Sacks of cement per cubic yard: 5.5
    - c. Footings: 2,500psi min., at 28 days
- B. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, gray Portland cement Type II. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C or Class F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, Portland blast-furnace slagtype IP, Portland-pozzolan cement.
- C. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source.
- D. Base Course
  1. Base course shall be installed under paving where indicated on the drawings. Unless shown otherwise, base course shall be Class 2 aggregate, as defined in the State of California Specifications (Section 26-1).
- E. Water: Potable and complying with ASTM C 94/C 94M.
- F. Air-Entraining Admixture: ASTM C 260.
- G. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material. Do not use calcium chloride or admixtures containing calcium chloride.
  1. Water-Reducing Admixture: ASTM C 494, Type A.
  2. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  3. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  4. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

#### 2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, manufactured for colored concrete.
  1. For integrally colored concrete, curing compound shall be pigmented type approved by coloring admixture manufacturer.
  2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.
  3. Provide W-1000 Clear Cure & Seal manufactured by Davis Colors, or approved equal.

## 2.5 RELATED MATERIALS

- A. Expansion Joint Material: Asphalt-impregnated wood fiber board (with removable polystyrene strip on top edge).
- B. Backer Rod: Butyl rubber (of material that will not react chemically with sealant).
- C. Sealant: Self-leveling non-sagging, puncture-resistant polyurethane sealant, designed for this use. Colors to match adjacent concrete color.
- D. Semi-rigid Joint Fillers: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- E. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

## 2.6 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), with the following properties:
  - 1. Compressive Strength (28 Days): 3500 psi (24.1 MPa)
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
  - 3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).
  - 4. Air Content: 5 percent plus or minus 1.5 percent.
- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

## 2.7 FABRICATING REINFORCEMENT

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

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85 and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F reduce mixing and delivery time to 60 minutes.

## 2.9 CUSTOM SEATBACKS

- A. Three custom metal seatbacks using ½" thick steel with laser cut letters, one each spelling Love, Joy, and Hope. Ease all edges, custom powder coat color to be coordinated with Owner's Representative. Securements per drawings. Provide shop drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.2 EDGE FORMS AND SCREED CONSTRUCTION

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

### 3.3 SUBGRADE

- A. Prepare and compact subgrade to 90% minimum compaction, unless noted otherwise, or unless indicated otherwise by the Geotechnical Engineer (by recommendation or in project report). Obtain approval from Owner's Representative prior to placing base, concrete, etc.

### 3.4 BASE COURSE

- A. Base course shall be of the depth shown on drawings after compaction.
- B. Compact base to 95% by rolling or other approved method, unless noted otherwise.

### 3.5 EMBEDDED ITEMS

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

### 3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Engineer.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- D. Score Joints: Sawcut or strike tool score joints in straight lines and in curves as shown on drawings. Joints shall be consistent, cleanly made, and with smoothed edges.
- E. Expansion Joints:
  - 1. Shall be set between separate pours, straight and true to line, top flush with finish grade, with smooth edges at surface.
  - 2. Repair damaged joints as required and as approved by Owner's Representative.
  - 3. Sealants shall be flush with adjacent surface of paving or wall.
    - a. Sealant shall be smooth, without voids or irregularities.

### 3.8 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

### 3.9 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

### 3.10 CONCRETE FINISHES

- A. Fine-Textured Broom Finish:
  - 1. First provide a floated finish.
  - 2. When the concrete has set sufficiently to begin the process, the surface shall be worked with a steel trowel to produce a dense, smooth, even finish, that is relatively free of defects but that may still show some trowel marks.
  - 3. Draw a soft-bristle broom across trowel-finished concrete surface across width of concrete transverse to direction of pedestrian travel, to provide a uniform, fine-line texture. At time of brooming, the troweled surface shall have hardened sufficiently to retain the scoring or ridges.
  - 4. Finish surface shall be clean with uniform and reasonably straight lines.
- B. Broom and Sandblast Finishes
  - 1. Paving Finishes shall be as shown on drawings.
  - 2. Where not shown otherwise on drawings, paving finish shall be: Light Broom Finish, with direction of pattern perpendicular to direction of travel on path, or to face of wall, where adjacent to building.
- C. Sandblast Finishes: Sandblasting shall be done at a time, and when weather conditions are acceptable to Owner's Representative. When operations are complete, sand shall be cleaned and removed from the site to the approval of the Owner's Representative.
  - a. Where shown as Light Sandblast, finish shall be evenly sandblasted after concrete has cured, to the approximately the texture of rough sandpaper. Provide 2ft x 2ft (min) sample for approval, prior to proceeding.
  - b. Where shown as Medium Sandblast, finish shall be evenly sandblasted after concrete has cured, to a texture that begins to expose the aggregates larger than sand in the concrete. Provide 2ft x 2ft (min) sample for approval, prior to proceeding.
- D. Where shown as Sand Finish, finish shall be washed or rubbed (or sandblasted) to expose sand aggregates.
- E. Where shown as Smooth Finish or Steel Trowel Finish, concrete shall be smooth, without trowel markings or roughened areas.

### 3.11 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing moisture-retaining-cover curing curing compound or a combination of these.

### 3.12 LINES AND LEVELS

- A. Finish grades on the drawings are shown in feet, to the top of all graded or paved surfaces, walls, curbs, etc. Slope uniformly between elevations shown and make transitions smooth and gradual, unless noted otherwise.
- B. Horizontal curves and radii shall be set tangent to adjacent straight lines or curves, unless noted otherwise. Curves shall be smooth and gradual.
- C. Other than minor field adjustments to meet the intent of the drawings, horizontal layout shall not vary from layout unless approved by Owner's Representative.

### 3.13 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Owner's Representative.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

### 3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
  - 1. Testing Services: Tests shall be performed according to ACI 301.

- END OF SECTION -

SECTION 32 18 16 – PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Poured in place synthetic playground surfacing consisting of a polyurethane binder mixed with 100% recycled, shredded tire material cushion layer that is capped with EPDM, TPV or Treated SBR rubber granules mixed with a polyurethane binder creating the Wear Course.
  - 2. Playground grass resilient surface system consisting of an artificial grass safety surface over a compacted base to provide a resilient, continuous surface
  - 3. Related Sections:
    - a. Section 06 10 63 Exterior Carpentry
    - b. Section 11 68 00 Play Equipment
    - c. Section 31 20 00 Earth Moving
    - d. Civil Notes on Drawings

1.3 DEFINITIONS

- A. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."
- B. SBR: Styrene-butadiene rubber.

1.4 REFERENCES

- A. Code of Federal Regulations (CFR)
  - 1. CFR 28 Part 36 (1991) Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule
  - 2. 36 CFR Part 1191 (2000) Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Play Areas, Final Rule

B. U.S. Consumer Product Safety Commission (CPSC)

1. CPSC (1997) Handbook for Public Playground Safety, Publication No. 325, U.S. Consumer Product Safety Commission, Washington, D.C. 20207, 301-504-0494

1.5 PERFORMANCE REQUIREMENTS

- A. Poured in place playground surfacing within playground use zones shall meet or exceed the performance requirements of the CPSC, ADA and Fall Height Test ASTM F1292-17a. The surface must yield both a peak deceleration of no more than 200 G-max and a Head Injury Criteria (HIC) value of no more than 1,000 for a head-first fall from the highest accessible portion of play equipment being installed as shown on drawings. IPEMA certification is required. (ASTM F1292-17a section 4.3.3: The laboratory test used to determine critical fall height shall have been conducted on surfacing material samples identical in design, materials, components, and thickness and manufactured as the installed playground surface).
- B. Playground grass resilient surface system shall comply with ASTM F1292-04, ASTM D2859, and ASTM F1951-99.
- C. Accessibility: NOTE: Children's outdoor play areas shall be in compliance with the Uniform Federal Accessibility Standards (UFAS) FED-STD-795 and the Architectural and Engineer Instructions (9AEI) Design Criteria.
- D. The requirements of the Americans with Disabilities Act. Accessibility Guidelines (ADAAG) 28 CFR Part 36 that provide equal or greater accessibility than the requirements of UFAS must also be met in children's outdoor play areas.
- E. Minimum Characteristics for Organic Loose-Fill Surfaces: According to ASTM F 2075.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certificates of Compliance:
  1. Provide a statement, signed by an official authorized to certify on behalf of the synthetic safety surfacing and manufactured wood product manufacturer, attesting that the surfacing meets the requirements of ASTM F 1292 for a head-first fall from the highest accessible portion of installed play equipment. The impact attenuating qualities of the surfacing system shall not be diminished in the surface areas covering hardware. Testing of product shall include tests conducted over hardware. The statement shall be dated after the award of the Contract, shall state the Contractor's name and address, and shall name the project and location. The statement shall also provide the name, address, and

- telephone number of the testing company, the date of the test, and the test results.
2. Provide certification by the authorized manufacturer's representative, upon completion of the installation, that the safety surfacing has been installed in accordance with manufacturer's instructions and complies with all specifications.
  3. Provide a Certificate of Insurance from the manufacturers of poured in place synthetic safety surfacing, covering both product and general liability, of not less than \$1,000,000. The issuing underwriter shall be AA rated.
- C. Shop Drawings: For each playground surface system type, include materials, plans, cross sections, drainage, installation, penetration details, and edge termination including loose fill edgings.
- D. Samples for Verification: For each type of playground surface system indicated.
1. Minimum 6-by-6-inch sample of synthetic rubber seamless surface, of each type and color specified for this project.
  2. Minimum 12-by-12-inch Sample of geosynthetic fabric.
- E. Product Schedule: For playground surface systems. Use same designations indicated on Drawings.
- F. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
1. Extent of surface systems and use zones for equipment.
  2. Critical heights for playground surfaces and fall heights for equipment.
- G. Qualification Data: For qualified Installer and testing agency
- H. Material Certificates: For each type of playground surface system, from manufacturer.
- I. Material Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for playground grass resilient surface system:
1. Impact Attenuation: ASTM 1292-04: Impact attenuation test results will be provided. These test results shall be certified and submitted on the letterhead of an independent testing lab. Impact attenuation test results shall meet or exceed Consumer Product Safety Commission Guidelines for impact attenuation (G-max and Head Injury Criterion "H.I.C."). Test results must be administered and evaluated under the same test and these results must be shown for three drops at each required temperature: 32o, 72o, 120o; yield less than 200 G's and less than 1,000 H.I.C. Only test results from ASTM testing approved laboratories, F8 committee will be acceptable. Approved testing laboratories are TSI and Detroit Testing.
  2. Permeability: Product shall meet or exceed a coefficient of permeability of five (5) feet per minute.
  3. Flammability (PILL test)

- J. Product Certificates: For each type of unitary synthetic playground surfacing system, from manufacturer.
- K. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each unitary synthetic playground surface system, certifying that the surfacing system meets the requirements of ASTM F1292-17a for a head-first fall from the highest accessible portion of the specified playground equipment.
- L. Field quality-control reports.
- M. Maintenance Data: For playground surface system to include in maintenance manuals.
- N. Warranty: Sample of special warranty.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
  - 1. For each type of synthetic playground surfacing system: Submit a listing of at least five (5) installations where products similar to those proposed for use have been installed and have been in successful service for a minimum period of three (3) years. List shall include projects which require a similar level of complexity, eg. Curvilinear forms, number of cutouts, transitions, poles and other special requirements. This list shall include owner or purchaser; address of installation; service or maintenance organization; date of installation; contact person; and phone number of the contact person.
  - 2. Contractor must be trained, experienced employees or certified installers who have successfully completed a "Certified Installers Training Program" required by TotTurf for the poured in place surfacing and be a "Manufacturer's Trained Installer" for the playground grass resilient surfacing.
- B. Source Limitations: Obtain playground surface system materials, including primers and binders, from single source from single manufacturer.
  - 1. Provide secondary materials including adhesives, primers, geosynthetics, and repair materials of type and from source recommended by manufacturer of playground surface system materials.
- C. Standards and Guidelines: Comply with CPSC No. 325, "Handbook for Public Playground Safety"; ASTM F 1292; and ASTM F 1487.

#### 1.8 EXTRA MATERIAL

- A. Contractor shall provide and deliver to the Owner, at the City's Corporation Yard in Forest Grove, OR, extra material for repair and replenishment of the safety surfaces. Provide the following material:

1. Poured in Place Playground Surfacing System:
  - Substrate material Adequate for 25 sf
  - Pre-mixed colored granules 5 sf of each color
  - Binder, in airtight container Adequate for 25 sf
2. Playground Grass Resilient Surfacing System:
  - Substrate material Adequate for 25 sf
  - Playground Grass Adequate for 25 sf
  - Backing Adequate for 25 sf
  - Infill Adequate for 25 sf
  - Seaming Adequate for 25 sf

#### 1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements.
- B. Sequencing and Scheduling: Safety surfacing shall be installed after the playground equipment is installed. The installation shall be coordinated with playground equipment and site element installation.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground surface system that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Reduction in impact attenuation.
    - b. Deterioration of surface and other materials beyond normal weathering.
  2. Poured in place: Warranty Period: Surface shall maintain impact attenuation characteristics and be guaranteed against defects in workmanship and material for a limited five (5) years from date of Substantial Completion.
  3. Playground grass resilient surfacing: Warranty Period: ten (10 years) for materials and workmanship and cover surface for wear through, deterioration and excessive fading/UV degradation.

PART 2 - PRODUCTS

2.1 POURED IN PLACE SYNTHETIC PLAYGROUND SURFACING SYSTEM

- A. Surface System: Safety surfacing shall consist of both recycled and synthetic materials meeting the requirements of this specification. The type of safety surfacing shall be TotTurf®, manufactured and installed by TotTurf®, or it's Certified Installers. Telephone 800-858-05
- B. Poured in Place Surface: The poured in place surface shall consist of 100 percent recycled granulated and or shredded tire material mixed with a polyurethane binder, then capped with either an EPDM, TPV an aliphatic binder or aromatic binder. It shall consist of a uniform material manufactured in such a way that the top portion meets the requirements specified herein for wear surface.
- C. Impact Attenuating Cushion Layer: Cushion Layer consists of recycled styrene butadiene rubber (SBR) adhered with a 100 percent solids polyurethane binder to form a resilient porous material. Strands of SBR may vary from 0.5 mm – 2.0 mm in thickness by 3.0 mm – 20 mm in length. SBR Crumb Rubber (5-9 Mesh) using sieve analysis ASTM D5644 with a fiber content of .1% or less mixed in. Foam or standard rubber granules are not to be permitted in Cushion Layer. Binder shall be between 10-14 percent of the total weight of the material, and shall provide 100 percent coating of the particles. The Cushion Layer shall be compatible with the Wear Course and must meet requirements herein for impact attenuation.
- D. Wear Course: Wear Course shall consist of Ethylene Propylene Diene Monomer (EPDM), Thermal Plastic Vulcanized (TPV) granules with polyurethane binder formulated to produce an even, uniform, seamless surface. Installation of surfacing shall be seamless (unless otherwise agreed upon by Owner) and completely bonded to concrete or asphalt subsurface. Material shall cover all foundations and fill around all elements penetrating the surface. EPDM shall be peroxide cured with an EPDM content of 26 percent and shall include a processing aid to prevent hardness with 26% poly content to maintain dynamic testing characteristics, weatherization and UV stability. ASTM D2240 (Shore A) hardness of 55-65, not less than 26 percent rubber hydrocarbons. Size of EPDM granules shall be 1.5-4 mm across. Binder shall be not less than 20 percent of total weight of rubber used in the wear surface, and shall provide 100 percent coating of the particles. TPV shall be angular granules with a (Shore A) hardness of 65°A ±5 and particle size between 1-4mm. Binder shall be not less than 20 percent of total weight of rubber used in the wear surface, and shall provide 100 percent coating of the particles. Thickness of Wear Course shall be a minimum ½ inch (12.7 mm). The Wear Course shall be porous.
- E. Binder: No Toluene Diphenyl Isocyanate (TDI) shall be used. No filler materials shall be used in urethane such as plasticizers and the catalyzing agent shall contain no heavy metals. Weight of polyurethane shall be no less than 8.5 lbs. /gal (1.02 Kg/1) and no more than 9.5 lbs. /gal (1.14 Kg/1). Manufacturer is permitted to modify the type of

urethane required to match extreme weather conditions. Substitutions must be equal to or exceed original quality.

F. Materials:

1. Wear Course – EPDM Granules and/or TPV Granules. Color to be a mix of 50% black and 50% beige granules.  
Manufacturer: NH Rubber Products and Rosehill Polymers  
As Distributed by: Robertson Industries Inc. (800) 858-0519 Location Used: Playground Area
2. Cushion Layer – TotTurf® Shredded SBR  
As Distributed by: Robertson Industries Inc. (800) 858-0519 Location Used: Playground Area
3. Binder – Aromatic VORAMER MR Products  
Manufacturer: DOW Chemical  
As Distributed by: Robertson Industries Inc. (800) 858-0519 Location Used: Playground Area
4. Binder – Aliphatic Urethane Premium, Non-Ambering  
Manufacturer: Accella Polyurethane Systems  
As Distributed by: Robertson Industries Inc. (800) 858-0519 Location Used: Playground Area
5. Critical Height: As indicated in drawings and/or manufacturer's specifications.
6. Overall Thickness: Not less than as required for critical height.

2.2 PLAYGROUND GRASS RESILIENT SURFACE SYSTEM

- A. Surface System: Resilient safety surface shall be Playground Grass Ultra as manufactured by ForeverLawn Inc. 1-866-992-7876. Color: Green. Resilient safety surface shall meet all of the following requirements independently and collectively:
- B. Blades: Primary blades are a slit film XP polyethylene with anti-microbial agent AlphaSan® integrated into the primary yarn. An anti-static agent must also be integrated into the construction so as to not allow static charge build-up. Secondary blade is a heat textured nylon monofilament. Polyethylene blades that are web or honeycomb fibrillated shall not be accepted.
- C. Weight: The product face weight will be 48 ounces. With backing, the total weight of the product will be 106 ounces.
- D. Tufting: The tufting gauge will be 3/8", pile height 1 1/2". Tufting configuration – dual yarn same row set up.
- E. Backing: The backing shall be a multi-layered, three parts.
  1. First single layer (stabilized primary consisting of polyester, fiberglass and polyurethane. It is 18 pic construction and 6 ounces.
  2. Second layer is a 48-ounce, urethane layer.
  3. Third is 6-ounce, geotextile fleece.

- F. Seams: Primary seaming system shall be a micromechanical seam, utilizing hook and loop technology.
- G. Resilient subsurface: 1" or 2" Safety Foam Pad which is a closed cell polyethylene planed pad.
- H. Infill: Material will be 10/20 or 14/20 crumb rubber granules or silica sand.
- I. Critical Height: As indicated in drawings and/or manufacturer's specifications
- J. Overall Thickness: Not less than as required for critical height.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, subgrade and substrate conditions, drainage, and other conditions affecting performance of the Work.
- B. Ensure compacted subgrade drains toward adjacent planting area for positive drainage.
- C. Finish Grade: Elevations of adjacent areas shall be as indicated on the Drawings and the safety surfacing manufacturer's directions. The appropriate subgrade elevation shall be as established for the particular safety surfacing to be installed.
- D. Verify that substrates are satisfactory for unitary playground surface system installation and that substrate surfaces are dry, cured, and uniformly sloped to drain within recommended tolerances according to playground surface system manufacturer's written requirements for cross-section profile.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. General: Prepare substrates and anchoring elements to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Entire surface shall be clean and free from any foreign and loose material.
- C. For poured in place surfacing:
  - 1. Finished Grade/Slope: Verify that finished elevations or adjacent areas are as indicated on the architectural or site plans, that the appropriate sub-grade elevation has been established for the particular safety surface to be installed,

and that the subsurface has been installed per architectural, site or equipment plans while meeting accessibility and use zones requirements.

2. Aggregate Sub-Base: Tolerance of aggregate sub-base shall be with 3/8" inch (10mm) in 10' ft. (3050 mm). Verify that aggregate sub-base has been fully compacted. Per ADA Guidelines: compacted Aggregate sub-base – 4" inches of 3/4" inch minus irregular stone with fines compacted to 95% percent in 2" inch watered lifts.

### 3.3 INSTALLATION, GENERAL

- A. General: Comply with playground surface system manufacturer's written installation instructions.

### 3.4 INSTALLATION OF POURED IN PLACE SYNTHETIC PLAYGROUND SURFAINGE SYSTEM

- A. Poured in Place Surfacing: Components of the poured in place surfacing shall be mixed on site in a rotating tumbler to ensure components are thoroughly mixed and are in accordance with manufactures recommendations. Installation of surfacing shall be seamless up to 2,000 square feet per day and completely bonded to concrete of sub-base. Material shall cover all foundations and fill around all elements penetrating the surface.
- B. Cushion Layer: Whenever practical, cushion layer of surfacing material shall be installed in one continuous pour on the same day of up to 2,000 square feet. When a second pour is required, step the seam (see detail) and fully coat the step of the previous work with polyurethane binder to ensure 100 percent bond with new work. Apply adhesive in small quantities so that new cushion layer can be placed before the adhesive dries.
- C. Wear Course: Wear Course must be either quality peroxide cured EPDM, TPV or Treated SBR granules. Wear surface shall be bonded to Cushion Layer. If necessary, additional primer will be used between the cushion layer and Wear Course. Apply adhesive to Cushion Layer in small quantities allowing the Wear Course to be applied before adhesive dries. Surface shall be hand troweled to a smooth, even finish. Except continuous and seamless up to 2,000 square feet per day (contact sales representative for seamless in excess of 2,000 square feet). Where seams are required due to color change, size or adverse weather, a step configuration will be constructed to maintain Wear Course integrity. The edge of initial pour shall be coated with adhesive and wearing surface mixture shall be immediately applied. Pads with multiple seams are encouraged to include a top coat of urethane before being placed into use. Butt joint seams are not acceptable except for repairs. Under special conditions and with owners written approval seams may be permitted in same color pad. Consult with manufacturer for specific applications.
- D. Perimeter: For installations over existing concrete, the perimeter must be saw cut to provide a keyway 1" inch deep x 1" inch wide, or formed during the pour, with surfacing rolled down into the void. Primer adhesive must be applied to all sides of the void.

When connecting to a concrete curb or border, the inside vertical edge shall be primed with adhesive and the final 2" inches of the cushion layer shall be tapered to allow the wear surface material to be 1.5" – 2" thick where it joins the concrete.

- E. Asphalt: When installing over new asphalt, a curb or other type of border is recommended around the entire pad to separate the new surface from other ground materials. Primer adhesive must be applied to the inside vertical edge of the border before poured in place surface installation.
- F. Thickness: Construction methods such as the use of measured screeds or guides shall be employed to ensure that the full depth of specified surfacing material is installed. Surfacing system thickness throughout the playground equipment use zone shall be as required to meet the impact attenuation requirements specified herein (see Section 2.1).
- G. Clean Up: Manufacturer installers shall work to minimize excessive adhesive on adjacent surfaces or play equipment. Spills of excess adhesive shall be promptly cleaned.
- H. Protection: The safety surface shall be allowed to fully cure in accordance with Manufacturer's instructions. The surface shall be protected by the owner from all traffic during the curing period of 48 hours or as instructed by the Manufacturer.
- I. Manufacturer Services: For poured in place safety surfacing, a manufacturer's representative who is experienced in the installation of playground safety surfacing shall be provided. The representative shall supervise the installation to ensure that the system meets the impact attenuation requirements as specified herein.

### 3.5 INSTALLATION OF PLAYGROUND GRASS RESILIENT SURFACE SYSTEM

- 1. SafetyFoam subsurface (resilient surface): 1" SafetyFoam for a 5' CFH and 2" SafetyFoam for a 9' CFH.B.
- 2. Artificial Turf: The turf will be rolled out in sections, cut around the poles, and seamed together using the micromechanical seaming system as the primary bond.
- 3. Securing: The turf will be secured around the perimeter. If using nailer boards, 1" staples will be used to secure the turf to the boards. Staples will be placed every 1/2 inch. (See edge details from manufacturer).
- 4. Protection: Surface installer shall be responsible for the protection of the rubber surface during the installation process. Surface installer shall be responsible for the protection of the surface during the curing period upon completion of the installation.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Testing Services: Testing and inspecting of completed applications of playground surface system shall take place according to ASTM F 1292.
- C. Remove and replace applications of playground surface system where test results indicate that it does not comply with requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with requirements.
- E. Clean-up: Do not allow adhesives on adjacent surfaces. Immediately clean up spills or excess adhesive. Site shall be kept free of tools, trash, and debris and installation materials on a daily basis.

### 3.7 REPAIRS AND PROTECTION

- A. Seamless Systems: Prevent traffic over system for not less than 48 hours after installation.
- B. Should the geotextile be damaged during installation or safety surface placement, a geotextile patch shall be placed over the damaged area extending beyond the damaged area a distance of 300 mm (12 in), or the specified seam overlap, whichever is greater.
- C. Should the drainage system be damaged during installation, replace the damaged area and ensure that the system still functions as designed

### 3.8 DISPOSAL

- A. Remove waste material--including trash, and debris--and legally dispose of it off the City's property.

### 3.9 MANUFACTURER'S SERVICES

- A. Services of a manufacturer's representative, or manufacturer's certified or authorized installer, who is experienced in installation of the specified playground safety surface, shall be provided. The representative shall supervise or inspect the installation to ensure that the safety surfacing meets the impact attenuation requirements as specified herein.
- B. Regardless of the installer, the manufacturer's representative shall certify that the installation complies with the manufacturer's instructions and specifications.

-END OF SECTION-

## SECTION 32 18 23 – ATHLETIC COURT SURFACING AND STRIPING

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. Preparation of surfaces.
- B. Court surfacing system.
- C. Striping.
- D. General work includes resurfacing with surface sealer at existing courts:
  - 1. Tennis Courts
  - 2. Pickleball Courts
  - 3. Basketball Court

#### 1.2 RELATED SECTIONS

- A. Section 32 16 10 Landscape Concrete

#### 1.3 REFERENCE STANDARDS

- A. American Sports Builders Association (ASBA).
- B. United States Tennis Association (USTA) Rules of Tennis.
- C. International Tennis Federation (ITF).
- D. National Basketball Association (NBA) Official Rules
- E. National Federation of State High School Associations (NFHS) Rule Book
- F. National Collegiate Athletic Association (NCAA) Rule Book
- G. International Federation of Pickleball (IFP)

#### 1.4 SUBMITTALS

- A. Product Data: Submit the following for approval, prior to start of construction.
  - 1. Submit manufacturer's product data, including surface and crack preparation and application instructions.
  - 2. Samples: Submit manufacturer's color samples of color coating.

3. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
4. Manufacturer's Project References: Submit manufacturer's list of successfully completed concrete tennis, basketball & multi-purpose court surface color coating system projects, including project name, location, and date of application.
5. Applicator's Project References: Submit applicator's list of successfully completed concrete tennis, basketball & multi-purpose court surface color coating system projects, including project name, location, type and quantity of color coating system applied, and date of application.
6. Warranty Documentation: Submit manufacturer's standard warranty.

#### 1.5 QUALITY ASSURANCE

##### A. Manufacturer's Qualifications:

1. Manufacturer shall have been regularly engaged, for past 5 years, in manufacture of concrete tennis, basketball & multi-purpose court surface color coating systems of similar type to that specified.
2. United States owned company.
3. Member: ASBA.
4. Manufacturer has surfaces that are classified by the ITF's (International Tennis Federation) pace classification program.

##### B. Installer's Qualifications

1. Applicator shall have been regularly engaged, for past 3 years, in application of tennis, basketball & multi-purpose court surface color coating systems of similar type to that specified.
2. Employ persons trained for application of tennis, basketball & multi-purpose court surface color coating systems.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

##### A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

##### B. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until application.
3. Store materials in clean, dry area indoors.
4. Store materials out of direct sunlight.
5. Keep materials from freezing.
6. Protect materials during storage, handling, and application to prevent contamination or damage.
7. Close containers when not in use.

1.7 AMBIENT CONDITIONS

- A. Do not apply court surface color coating system when air or surface temperatures are below 50 degrees F during application or within 24 hours after application.
- B. Do not apply court surface color coating system when rain is expected during application or within 24 hours after application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: SportMaster Sport Surfaces, or approved equal, PO Box 2277, 2520 South Campbell Street, Sandusky, Ohio 44870. Toll Free 800-326-1994. Fax 877-825-9226. Website [www.sportmaster.net](http://www.sportmaster.net). E-mail [info@sportmaster.net](mailto:info@sportmaster.net).

2.2 MATERIALS

- A. Basis of Design: Concrete Court Surface Color Coating System: SportMaster Color Coating System or approved equal.
  - 1. Surface colors shall be selected from manufacturer's samples. Submit to Owner's Representative within 20 days of Notice to Proceed.
  - 2. Materials are to be of surfacing manufacturer's system. Use of traffic paints (oil or alkyd) is prohibited.
  - 3. All color materials shall be of one manufacturer's system.
- B. Crack Sealant: SportMaster "Crack Magic" or approved equal.
  - 1. 100 percent acrylic emulsion elastomeric crack sealant.
  - 2. Seals cracks and expansion joints up to 1/2-inch-wide in concrete pavement.
  - 3. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs.
  - 4. Non-Volatile Material: 61 percent, plus or minus 5 percent.
  - 5. Colors: Neutral.
- C. Crack Filler: SportMaster "Acrylic Crack Patch" or approved equal.
  - 1. 100 percent acrylic emulsion trowel-grade crack filler.
  - 2. Fills cracks in concrete pavement up to 1 inch wide.
  - 3. Chemical Characteristics, by Weight, Minimum:
    - a. Acrylic Emulsion: 10.0 percent.
    - b. Hiding Pigment: 0.2 percent.
    - c. Mineral Inert Fillers: 78.0 percent.
    - d. Film Formers, Additives: 1.8 percent.
    - e. Water: 8.5 percent.
  - 4. Weight per Gallon at 77 Degrees F: 15.2 lbs., plus or minus 1.0 lbs.
  - 5. Non-Volatile Material: 80 percent, plus or minus 5 percent.
  - 6. Colors: Neutral.

- D. Patch Binder: SportMaster "Acrylic Patch Binder" or approved equal.
  - 1. 100 percent acrylic emulsion liquid binder.
  - 2. Mix on-site with sand and cement.
  - 3. Levels and repairs low spots and depressions up to 3/4-inch-deep in concrete pavement.
  - 4. Fills Cracks in concrete up to 1" in width.
  - 5. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs
  
- E. Adhesion Promoter: SportMaster "Acrylic Adhesion Promoter" or approved equal.
  - 1. Acrylic emulsion primer.
  - 2. Primes concrete surface and promotes adhesion of color coating system materials.
  - 3. Weight per Gallon at 77 Degrees F: 8.7 lbs., plus or minus 0.5 lbs.
  
- F. Filler Course: SportMaster "Acrylic Resurfacer" or approved equal.
  - 1. 100 percent acrylic emulsion resurfacer.
  - 2. Mix on-site with silica sand.
  - 3. Apply to adhesion promoter or previously colored acrylic surfaces in preparation of color coating system.
  - 4. Chemical Characteristics, by Weight, Minimum:
    - a. Acrylic Emulsion: 44.0 percent.
    - b. Hiding Pigment: 2.0 percent.
    - c. Mineral Inert Fillers: 5.0 percent.
    - d. Film Formers, Additives: 0.2 percent.
    - e. Water: 45.0 percent.
  - 5. Weight per Gallon at 77 Degrees F: 8.5 lbs., plus or minus 0.5 lbs.
  - 6. Non-Volatile Material: 27.5 percent, plus or minus 5.0 percent.
  
- G. Color Coating: SportMaster "ColorPlus System" or approved equal.
  - 1. 100 percent acrylic emulsion coating.
  - 2. Mix on-site with silica sand and water.
  - 3. Color coats tennis, basketball, and multipurpose courts.
  - 4. Weight per Gallon at 77 Degrees F: 9.2 lbs., plus or minus 0.5 lbs.
  - 5. Colors: Light blue and light green as shown on drawings.
  
- H. Line Markings Primer: SportMaster "Stripe-Rite" or approved equal.
  - 1. 100 percent acrylic emulsion primer, clear drying.
  - 2. Primes line markings and prevents bleed-under for sharp lines.
  - 3. Chemical Characteristics, by Weight, Nominal:
    - a. Acrylic Emulsion: 38.0 percent.
    - b. Hiding Pigment: 0.0 percent.
    - c. Mineral Inert Fillers: 7.0 percent.
    - d. Film Formers, Additives: 1.5 percent.
    - e. Water: 50.0 percent.
  - 4. Weight per Gallon at 77 Degrees F: 8.9 lbs., plus or minus 0.5 lbs.
  - 5. Non-Volatile Material: 29 percent, plus or minus 5 percent.
  
- I. Line Paint: SportMaster "Textured Line Paint" or approved equal.
  - 1. Pigmented, 100 percent acrylic emulsion line paint.

2. Line marking on concrete tennis, basketball & multi-purpose courts.
3. Chemical Characteristics, by Weight, Nominal:
  - a. Acrylic Emulsion: 25.89 percent.
  - b. Pigment: 14.90 percent.
  - c. Mineral Inert Fillers: 13.12 percent.
  - d. Additives: 4.73 percent.
  - e. Water: 41.36 percent.
4. Weight per Gallon at 77 Degrees F: 10.65 lbs., plus or minus 0.75 lbs.
5. Non-Volatile Material: 45.17 percent, plus or minus 5 percent.
6. Colors: White.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine concrete court surfaces to receive color coating system.
- B. Verify:
  1. Suitable vapor barrier beneath concrete slab.
  2. Perimeter drainage to prevent moisture accumulation beneath concrete surface.
  3. Curing compounds have not been used on concrete surface.
  4. Concrete tennis, basketball & multi-purpose courts meet ASBA requirements.
- C. Notify Owner's Representative of conditions that would adversely affect application or subsequent use.
- D. Construction Observation and Certification
  1. Prior to the start of any work of this section, the Contractor shall arrange a meeting at the job site with the following representation:
    - a. Contractor
    - b. Surfacing Subcontractor
    - c. Color System Manufacturer's Representative
    - d. Consultant
    - e. Owner's Representative
  2. The Contractor shall observe the placing, finishing, and curing operations of court construction. Advise the General Contractor concerning methods and quality of work.
- E. Do not begin surface preparation or application until unacceptable conditions are corrected.

#### 3.2 SURFACE PREPARATION

- A. Protection of In-Place Conditions: Protect adjacent surfaces and landscaping from contact with concrete tennis, basketball & multi-purpose court surface color coating system.
- B. Prepare surfaces in accordance with manufacturer's instructions.

- C. Existing Concrete:
  - 1. Sandblast, shotblast, or scarify smooth concrete surfaces to roughened texture similar to medium broom finish.
  - 2. Acid etch surface per manufacturers specifications, then rinse thoroughly.
- D. Remove dirt, dust, debris, oil, grease, sealers, curing compounds, vegetation, loose coatings, loose materials, and other surface contaminants which could adversely affect application of concrete tennis, basketball & multi-purpose court surface color coating system. Pressure wash entire surface.
- E. Repair cracks, depressions, and surface defects in accordance with manufacturer's instructions before application of color coating.
- F. Repair spalled areas and level depressions 1/8 inch and deeper with patch binder in accordance with manufacturer's instructions.
- G. Apply adhesion promoter over entire concrete surface in accordance with manufacturer's instructions.
- H. Apply 1 coat of filler course to provide smooth underlayment for application of color coating.
- I. Ensure surface repairs are flush and smooth to adjoining surfaces.

### 3.3 APPLICATION

- A. Prior to commencing any of the work of this section, the Contractor shall certify in writing to the satisfaction of the Owner's Representative that the courts are in a condition acceptable for the work of this section.
- B. Mix materials in accordance with manufacturer's instructions.
- C. Apply concrete court surface color coating system in accordance with manufacturer's instructions at locations indicated on the Drawings.
- D. Apply Filler Course and Color Coating with a 50-60 durometer, soft rubber squeegee.
- E. Filler Course:
  - 1. Apply 1 coat on new concrete or existing acrylic surfaces with minimal repairs.
  - 2. Apply 2 coats on existing acrylic surfaces with extensive cracks or low spot repair.
- F. Apply a minimum of 2 coats of color coating to prepared surfaces in accordance with manufacturer's instructions.
- G. Allow material drying times in accordance with manufacturer's instructions before applying other materials or opening completed surface to foot traffic.

### 3.4 LINE MARKINGS

- A. Lay out tennis, basketball and multi-purpose court line markings in accordance with the rules of the governing body referenced by the Owner's Representative, from the following list:
  - 1. USTA Rules of Tennis
  - 2. NBA Official Rules for professional basketball
  - 3. NFHS Rules for high school basketball
  - 4. NCAA Rules for college basketball
  - 5. International Federation of Pickleball (IFP)
  - 6. Other required game layout
- B. Apply line markings primer, after masking tape has been laid, to seal voids between masking tape and tennis, basketball and multi-purpose court surface to prevent bleed-under when line paint is applied.
- C. Apply a minimum of (1) coat of line paint in accordance with manufacturer's instructions.

### 3.5 PROTECTION

- A. Allow a minimum of 24 hours curing time before opening courts for play.
- B. Protect applied court surface color coating system to ensure that coating system will be without damage or deterioration at time of Substantial Completion.
- C. Erect temporary barriers sufficient to protect coatings during drying and curing.
- D. Lock existing gates to prevent use until acceptance by the owner's representative.

### 3.6 WEATHER LIMITATIONS

- A. Do not install when rainfall is imminent or extremely high humidity prevents drying.
- B. Do not apply unless surface and air temperature are 50°F and rising
- C. Do not apply if surface temperature is in excess of 140°F.

### 3.7 CLEAN UP

- A. Remove all containers, surplus materials and debris. Dispose of materials in accordance with local, state and Federal regulations.
- B. Leave site in a clean and orderly condition, as approved by the Owner's Representative.

- END OF SECTION -

## SECTION 32 33 00 - SITE FURNISHINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following; see drawings for clarification as to base bid and add alt:
  - 1. Ping Pong Tables
  - 2. Picnic Tables
  - 3. Barbecues
  - 4. Hot Coal Receptacle
  - 5. Trash Receptacles
  - 6. Signage
    - a. Standard City Park Sign
    - b. Welcome/Donor Recognition Sign
    - c. Welcome Signs
  
- B. RELATED SECTIONS
  - 1. Division 32 Section "Landscape Concrete "

#### 1.2 SUBMITTALS

- A. All submittals shall be in accordance with the General and Special Conditions.
- B. Product Data: For each type of product indicated.
- C. Samples: For each exposed finish – color, texture and finish either from standards or custom as indicated for each product listed below.
- D. Material Certificates: For site furnishings, signed by manufacturers.
- E. Maintenance Data: Provide for each product
- F. Shop Drawings: Show fabrication and installation details for custom fabricated elements.
- G. Provide model and/or detail drawings for all fabricated elements.

#### 1.3 SUBSTITUTIONS

- A. The specified site furnishings provide specific aesthetic character, and qualities that contribute to the quality and purpose of the project design. Any equipment proposed for substitution shall match material, size, appearance and configuration, and shall provide the same level of quality

and esthetic appearance as intended by the specified equipment listed in these specifications or shown on the drawings.

- B. If site furnishings other than what is shown on the drawings and described in these specifications is proposed, shop drawings shall be provided to illustrate how the design and layout is modified to accommodate proposed furnishings installation. Submit a detailed list of any deviations from the specified product.

#### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of slabs, walls, and other construction contiguous with site furnishings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating elements without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for minor adjustment and fitting at site.

#### 1.5 COORDINATION

- A. Coordinate installation of anchorages for site furnishings and utility lines where required. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.6 REFERENCES

- A. ASTM A 36 - Carbon Structural Steel.
- B. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A 269 – Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- D. ASTM A 312- Seamless and Welded Austenitic Stainless Steel Pipes
- E. ASTM A 500 Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- F. Aluminum Association (AA): Aluminum Finishes.
- G. American Society for Testing and Materials (ASTM):

1. ASTM B 241 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
2. ASTM B 597 - Standard Practice for Heat Treatment of Aluminum Alloys.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Best Outdoor Ping Pong Tables  
Portland, Oregon  
(866) 926-3839  
Website: [www.bestoutdoorpingpongtables.com/contact-us/](http://www.bestoutdoorpingpongtables.com/contact-us/)
- B. Timberform (picnic tables)  
1300 SW Sixth Avenue Suite 310  
Portland, Oregon 97201-3464  
1-503-332-4308  
Website: [www.timberform.com](http://www.timberform.com)
- C. Wabash Valley Manufacturing, Inc. (barbeque grills)  
505 E. Main Street  
P.O. Box 5  
1-800-253-8619  
Website: [www.wabashvalley.com/](http://www.wabashvalley.com/)
- D. Pilot Rock (hot coal bin)  
RJ Thomas Mfg. Co. Inc.  
5648 U.S. Hwy. 59  
Cherokee, IA 51012-0946  
1-800-762-5002  
Website: [www.pilotrock.com/](http://www.pilotrock.com/)
- E. Tournesol Siteworks / FairWeather Site Furnishings (trash receptacles)  
1540 Leader International Drive  
Port Orchard, WA 98367-6437  
360-895-2626  
800-323-1798  
Website: [www.tournesolsiteworks.com](http://www.tournesolsiteworks.com)
- F. Macadam Aluminum & Bronze (donor sign specifically)  
3323 NW Yeon Ave., Portland, OR 97210  
1-503-285-0331  
Website: <http://www.macadamfoundry.net/>

## 2.2 FABRICATION GENERAL

- A. Apply Anti-graffiti coating per manufacturer's instructions on all precast concrete site furnishings, and signs. The material shall be: Bullet Proof by Seal Guard Inc. 866-625-4550, or approved equal.
1. For metal signs:  
Vitrecoem, Anti-Graffiti Glazed Coating System for metal work, by Bithell, Inc., or approved equal.  
1004 East Edna Place, Covina, CA 91724.  
Telephone 626 331 2292, Fax 626 339 4588,  
Web site – [www.vitrocem.com](http://www.vitrocem.com)
  2. For wood elements in site furniture:  
Vitrecoem Anti-Graffiti Glazed Coating System for wood, by Bithell, or approved equal.  
1004 East Edna Place, Covina, CA 91724.  
Telephone 626 331 2292, Fax 626 339 458  
Web site – [www.vitrocem.com](http://www.vitrocem.com)

## 2.3 PING PONG TABLES

- A. **Basis of Design Product: Cornilleau Pro Park Outdoor Model**, , Ping-Pong table, or approved equal.
1. Size of Table: 107.9" long, 60" wide. Top: 3.5" profile mat surface.
  2. Color: Grey – No. 127 137.
  3. <http://www.cornilleau.com/wp-content/uploads/2013/06/EN-Fiche-technique-PARK.pdf>
  4. Surface mount, per manufacturer's recommendations.
  5. Contact: (678) 257-4350

## 2.4 PICNIC TABLES

- A. **Basis of Design Product: Timberform Greenway Picnic Table with Seats No. 2162-6 and Timberform Greenway Table Accessible 2163-6**, or approved equal.
1. Two standard picnic tables and two accessible picnic tables, rectangular, multi-pedestal, with kiln dried Douglas Fir wood slats.
    - a. Picnic Table with Seats No. 2162-6
      - 1) Size: 5'-10" long, 4'-7" wide.
      - 2) Table height: 2'-6". Seat height: 1'-4"
      - 3) Overall assembly dimensions: Per manufacturer's recommendations.
      - 4) Color: Black powder coat frame.
      - 5) Embed mount, in 18" diameter, 30" deep concrete footings (with No. 4 steel rebar), per manufacturer's recommendations.
    - b. Picnic Table with Seats No. 2163-6
      - 1) Size: 7'-10" long, 4'-7" wide.
      - 2) Table height: 2'-8". Seat height: 1'-6"

- 3) Overall assembly dimensions: Per manufacturer's recommendations.
  - 4) Color: Black powder coat frame.
  - 5) Embed mount, in 18" diameter, 30" deep concrete footings (with No. 4 steel rebar), per manufacturer's recommendations.
- c. Info: <http://site-furnishings.columbia-cascade.com/columbia/Files/Images/Products/BaseProducts/Tables%20&%20Chairs%20Catalog%20Pages.pdf>
- 1) Contact: 1)800) 547-1940, Ext. 991.

## 2.5 BARBECUES

- A. **Wabash Valley Model No. #GR100N (Firebox F/200 Grill) Outdoor Grill, or approved equal.**
1. Two barbecue grills. 3/16: steel, continuous weld-type construction, with adjustable heigh grill.
    - a. Dimensions:20" wide, 15" deep, with 10" high fire box.
    - b. Height: 27" high to bottom of fire box.
    - c. Finish: Rust-resistant Black enamel.
  2. In ground mount, in 18" diameter, 3' deep concrete footing, per manufacturer's recommendations.

## 2.6 HOT COAL RECEPTACLE

- A. **Pilot Rock Hot Coal Bin, #HCB-1, or approved equal.**
1. Surface mount, with BR-4HSA anchors, per manufacturer's recommendations.
  2. Finish: Powder Coat
  3. Color: Black
  4. Lock: Model PL-1 brass padlock
- B. Provide to Owner, one each:
1. 12-quart steel collection can, CNG-W10120
  2. Grill and grate scraper, GGS/B-1

## 2.7 TRASH RECEPTACLES

- A. **FairWeather Site Furnishings/Tournesol Siteworks, Model TR-4, Trash Receptacle with 30 Gallon liner, or approved equal,** 30-gallon stainless steel trash receptacle with 14" diameter opening, matching Hinged Dome Top with vinyl-coated security cable, hinged side opening door, and lock assembly,, and 30-gallon black polyethylene liner.
1. Powder-Coat color: Mineral Bronze.
  2. Base: Leveling Feet
  3. Surface Mount

## 2.8 SIGNS

- A. Contractor shall submit shop drawings, as shown on the drawings, for approval prior to installation. For standard City park signs to replace existing signs, coordinate with City staff. For Welcome/Donor (bronze) sign, digital artwork will be provided by City for fabrication. For Welcome Signs at Infinity Tree and Nursery Log, digital artwork will be provided by City for fabrication.
- B. For each sign type, Contractor shall submit identifying information about sign, with information about fabricator, showing:

Company name of fabricator, and name of contact person

Address & phone number of contact, at fabricator

Website (if applicable) & email address of contact at fabricator

## 2.9 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Post Setting: Set cast-in support posts in concrete footing plumb or at correct angle and aligned and at correct height and spacing.

- END OF SECTION -

SECTION 32 84 00 – IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Volume 1 - Contracting Requirements, and Division - 01 General Requirements apply to the Work of this Section.

1.02 SCOPE OF WORK

- A. This section specifies the performance standards for the Project irrigation system.
- B. Furnish all labor, materials, supplies, tools, transportation and equipment necessary to complete the irrigation system work as required and specified herein.
- C. The irrigation system shall be capable of delivering sufficient amount of water to maintain planted and seeded vegetation in healthy and thriving condition, and of providing adequate coverage to all plantings.
- D. It is the intent of these plans and specification that the all equipment installed for the irrigation system is complete and workable. It is the Contractor's responsibility to make sure that the equipment furnished is compatible and adheres to all regulations. Any discrepancies should be noted immediately and should be reported to the OWNER'S REPRESENTATIVE for clarification.

1.03 QUALITY ASSURANCE & REQUIREMENTS

- A. Contractor Qualifications: The Contractor shall hold an Oregon landscape construction professional (LCP) with backflow preventer phase of the license, and a landscape contracting business license. Testing of the backflow preventer shall be by a professional certified by the Oregon Health Authority. The irrigation system must be installed under the direct supervision of said licensed and certified professionals.
- B. The drawings are diagrammatic only. It is the intent of the plans and specifications that the irrigation system shall efficiently and uniformly irrigate all areas according to horticultural and soil requirements, and that it shall be complete in every respect and shall be ready for operation to the satisfaction of the OWNER'S REPRESENTATIVE.
- C. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. Carefully investigate the structural and finished conditions affecting all of this work and plan this work, accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting and architectural features.

- D. The irrigation system shall operate without leaks and without causing erosion and excessive runoff (as determined by the City).
- E. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Owner. When the nature of the repairs as determined by the Owner constitutes an emergency (e.g. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner
- F. Protection: Erect and maintain barricades, warning signs and lights and provide guards as necessary or required to protect all persons on the site.
- G. Manufacturer's directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in this Contract furnish directions covering points not shown in the drawings and specifications.
- H. Work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.
- I. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to Owner's satisfaction by the Contractor without any additional expense to the Owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.
- J. Ordinances and Regulations
  - 1. All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work shall be carried out by the Contractor. Anything contained in these Performance Specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these Performance Specifications call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of the Performance Specifications shall take precedence.
    - a. Local and Regional Agencies.  
  
Forest Grove City code.
  - 2. Reference Publications (Not limited to the following):
    - a. American Society for Testing and Materials (ASTM)
    - b. American Society of Mechanical Engineers (ASME)
    - c. Manufacturers Standardization Society of the Valve and Fittings (MSS)

- d. National Sanitation Foundation (NSF)
  - e. National Electric Code (NEC)
  - f. Plastic Pipe Institute (PPI)
  - g. Underwriters Laboratories (UL)
  - h. Uniform Plumbing Code (UPC)
  - i. Oregon Administrative Rules (OARs), Oregon Electrical Specialty Code (OESC), Oregon Plumbing Specialty Code (OPSC), Current Editions.
3. When contract documents call for materials or construction of better quality or larger size than required by above-mentioned rules and regulations, provide quality and size required by contract documents.
  4. If quantities are furnished either in specifications or on drawings, quantities are furnished for information only. It is Contractor's responsibility to determine actual quantities of material, equipment, and supplies required by the project and to complete independent estimate of quantities and wastage.
  5. Notify OWNER'S REPRESENTATIVE in writing prior to construction about discrepancies between contract documents and existing site conditions or manufacturer's specific recommendations for use of their product.
  6. Contractor is responsible for damage to site amenities during construction. Replace damaged items with identical materials of equal value to match existing conditions. Make replacements at no additional cost to contract price.
  7. All electrical control panels with controls must be built in accordance to N.E.C., U.L. and E.T.L. standards. The electrical components and enclosure must be labeled as a complete U.L. listed assembly with manufacturer's U.L. label applied to the door. All equipment and wiring must be mounted within the enclosure and labeled for proper identification.

#### 1.04 Performance Requirements

- A. Design the irrigation system to keep plants in a healthy and thriving condition.
- B. Maintain existing irrigation system functional and irrigation of existing landscape areas operational
- C. Stake or brace irrigation heads to minimize the movement or displacement caused by operation of the system.
- D. Test the backflow preventer, as required by the Oregon Health Authority (OHA). Contractor shall deliver certification to the Owner that installation of the water meter and the backflow preventer have passed approval per the requirements of the OHA, before project completion.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. The Contractor shall consult all other sections to determine the extent and character of related work and to properly coordinate work specified herein with that specified elsewhere to produce a finished workmanlike installation satisfactory to the OWNER'S REPRESENTATIVE.
2. Complete sleeve installation (not otherwise provided) in coordination with paving and other concrete pours.
3. Coordinate to ensure that an electrical power source is in place.
4. Coordinate system installation work specified in other Sections and coordinate with landscape installer to ensure plant material is uniformly watered in accordance with intent shown on drawings.

B. Permits and Fees: Contractor is responsible to obtain all required permits and pay all associated fees unless otherwise noted.

C. Sequencing:

1. The entire irrigation system shall be under complete automatic operations for a period of two days prior to any planting.
2. Final Acceptance and start of guaranty period shall occur no later than the end of the specified Operation and Maintenance of Irrigation Period.

D. Checklist:

1. Provide a signed and dated checklist and deliver to the OWNER'S REPRESENTATIVE prior to final review of the work.
2. Use the following format:
  - a. Inventory of existing system: state of equipment, by whom and date.
  - b. Confirmation of service pressure: psi, by whom and date.
  - c. Plumbing permits: if none required, so noted.
  - d. Materials approvals: approved by and date.
  - e. Pressure line tests: by whom and date.
  - f. Record drawings: received by and date.
  - g. Controller charts: received by and date.
  - h. Materials furnished: received by and date.

- i. Operation and maintenance manuals: received by and date.
- j. System and equipment operation instructions: received by and date.
- k. Manufacturer's warranties if required: received by and date.
- l. Written guarantee: received by and date.
- m. Lowering of heads in stormwater areas: if incomplete, so state

1.06 ACTION SUBMITTALS

- A. There are no action submittals required.

1.07 INFORMATIONAL SUBMITTALS

- A. Irrigation system design shop drawings
- B. Materials List: Complete manufacturer's technical data and installation instructions shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used. Quantities of materials need not be included. Equipment or materials installed or furnished without prior approval of the OWNER'S REPRESENTATIVE may be rejected and the Contractor may be required to remove such materials from the site at his own expense.
- C. Field test results
- D. As-built drawings
  - 1. The Contractor shall maintain reasonable clear and detailed records of all underground installations. These records shall always be available to the OWNER'S REPRESENTATIVE for verification while the work is in progress. These records are part of the work under this contract and shall be delivered to the Engineer in a good and acceptable condition prior to final acceptance of the work.
  - 2. Record pipe and wiring network alterations daily. Record work that is installed differently than shown on construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller assembly, each sleeve end, each stub-out for future pipe or wiring connections, and other irrigation components enclosed within valve box.
  - 3. Turn over "Record Drawings" to Construction Manager. Completion of Record Drawings is required prior to final construction review at completion of irrigation system installation.
  - 4. Record dimensioned locations and depths for each of the following:
    - a. Point-of-Connection

- b. Sprinkler pressure line (mainline) routing. Provide dimensions for each 100 lineal feet (maximum) along each routing and for each change in direction.
  - c. Gate Valves
  - d. Sleeving/Conduits
  - e. Junction Boxes
  - f. Remote Control Valves
  - g. Quick Coupling Valves
  - h. Control Wire Routing
5. Other related items as may be directed by the OWNER'S REPRESENTATIVE.
  6. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs or pavements).
  7. Record all changes which are made from the Contract Drawings, including changes in the pressure and non-pressure lines.
  8. Record all required information on a set of black line prints of the drawings. Do not use these prints for any other purpose.
  9. Maintain information daily. Always keep drawings at the site and available for review by the Owner's representative.
  10. When record drawings have been approved by the OWNER'S REPRESENTATIVE, transfer all information to a set of reproducible prints using permanent India ink. Changes using ballpoint pens are not acceptable.
  11. Make dimensions accurately at the same scale used on original drawings or larger. If photo reduction is required to facilitate controller chart housing, notes or dimensions must be a minimum 1/4 inch in size.
  12. Reproducible prints (5 maximum) will be furnished by the OWNER'S REPRESENTATIVE at cost for printing and handling.
  13. Use appropriate eradicating fluid for removing original lines and dimensions where changes are made. Completed reproducible shall be equal to the original drawings.

E. Irrigation schedule

- F. Controller Charts: The Contractor shall provide controller charts, one (1) for each controller, which shall be placed on the inside face of each controller enclosure door. Record drawings from which the charts are to be made shall be approved by the Engineer prior to preparing the charts.
1. Each chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow. Items on the controller chart shall include.
    - a. Point-of-Connection
    - b. Routing of pressure mainlines.
    - c. Routing of control valves.
    - d. Locations of remote control valves, gate valves, and quick coupling valves.
  2. The chart shall be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, irrigation symbols shall be enlarged to a size that will be readable when reduced.
  3. The chart shall be a black line print, and a different color shall be used to indicate the area of coverage for each station.
  4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum ten (10) mils.
  5. These charts shall be completed and approved prior to final inspection of the irrigation system.
- G. Tools:
1. One (1) Quick Coupler attachment key equipped with standard thread hose bib per (5) Quick Couplers installed on the project.
  2. One (1) key for locking Quick Coupler covers per (5) Quick Couplers installed on the project.
  3. Two (2) operating keys suitable to operate each type of valve used.
  4. One (1) set of automatic controller cabinet keys for each controller used.
- H. Operation and Maintenance Manual
1. Prepare and deliver to the OWNER'S REPRESENTATIVE, prior to the start of maintenance, all required and necessary descriptive material in complete detail and sufficient quantity properly prepared in two (2) individually bound copies. Describe the material installed in sufficient detail to permit qualified operating personal to understand, operate and maintain all equipment. Each manual shall include the following:
    - a. Index sheet, stating Contractor's address and telephone number.

- b. Duration of guarantee period with guarantee forms.
  - c. List of equipment with names and addresses of manufacturer's local representative.
  - d. Complete operating and maintenance instructions on all major equipment.
  - e. Spare parts list and related manufacturer information for all equipment.
2. Operation and maintenance manuals shall be delivered to the OWNER'S REPRESENTATIVE 10 calendar days prior to final inspection. The manuals shall describe the material installed:

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Materials: All materials required to complete the work under this contract shall be furnished by the Contractor.
- B. Storage and Handling Requirements
  1. The Contractor shall provide all temporary storerooms and shops that he may require at the site for the safe and proper storage of his materials, tools, etc. These rooms shall be constructed only in locations approved by the Engineer, as designated on the location map, and must in no way interfere with the work of any other Contractor. At such times as these rooms interfere with the proper installation and completion of the work, they shall be removed by this Contractor at his expense, within three (3) days after having been notified by the Engineer that such removal is necessary.
  2. The Contractor is cautioned to exercise care in handling, loading, unloading, and storing plastic pipe and fittings. All plastic pipe and fittings shall be stored under cover before using, and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lay flat so as not to be subject to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded until said section of pipe is cut out and rejoined with a coupling.
  3. Bulk Materials:
    - a. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
    - b. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

#### 1.09 WARRANTY

- A. After final irrigation system acceptance inspection, provide a written labor and material guarantee for the irrigation system to function properly for the entire duration of the warranty period which shall be one (1) year after Beneficial Occupancy.

- B. Repairs: Contractor shall make necessary repairs to the system as well as to other work affected by defects in the system during warranty period. Repairs shall be made at the Contractor's sole expense.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

#### A. Water Source

1. Irrigation system shall be connected to an existing water supply point of connection downstream of an existing water meter.
2. Contractor shall verify available flow and pressure.
3. Irrigation scheduling and system design shall be coordinated with the overall Project's Water Use Plan.
4. Water Use Plan shall include a water shortage contingency plan that describes plans, procedures and methods for minimizing the use of water in compliance with State and Local water restriction mandates.

#### B. Water Supply Pipe

1. All plastic pipe shall be continuously and permanently marked with the following information:
  - a. Manufacturer's name.
  - b. Kind of pipe.
  - c. Material.
  - d. Size NSF approved.
  - e. Schedule or Class of type
  - f. The manufacturer shall also mark the date of extrusion on his pipe. This dating shall be done in conjunction with records to be held by the manufacturer for two years covering quality control tests, raw material batch numbers, and any other information deemed necessary by the manufacturer. Guarantee shall cover workmanship of materials from the plastic pipe manufacturer for all plastic pipe and fittings.
2. Materials
  - a. Main irrigation lines shall be Schedule 40 PVC for lines one and one half inches (1-1/2") and smaller and Class 315 PVC for lines two inches (2") and larger.



2. Materials

- a. All main shut-off valves shall be gate valves.
- b. Gate valves two- and one-half inches (2-1/2") and smaller shall be bronze or brass.
- d. All valves and sizes shall be as indicated on the plan.
- e. A concrete box and cover of adequate size to allow maintenance freedom shall be installed over each main shut-off valve in the system. See plan details for proper box installation.

F. Ball Valves

1. Manufacturer: Ball valves shall be manufactured by Nibco. Model shall be 4660-S Manual Flush Ball Valve series or approved equal.
2. Description
  - a. Valves shall be operated by a handle or pneumatically or electrically by an actuator. 1/2" valves shall be full port (equal to or greater than the minimum inside diameter of Sch 80 pipe).
  - b. Valves shall be capable of being adjusted externally for seat wear.
3. Materials
  - a. Ball valves 2 inches or smaller shall be produced of shall be produced of PVC Type I, cell classification 12454. End connectors shall be thread type.
  - b. Valve body shall have two stem stops. Valve carrier shall have a full block polymeric locking strip. Valve seats shall be produced of Teflon® material.
  - c. Valve stem shall have two O-rings.
  - d. Valve O Valve O-rings shall be made of EPDM.
  - e. All ball valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards. Valves shall meet or exceed ASTM's standard F-1970 for pressure rating.

G. Backflow Prevention Device

1. Manufacturer: Shall be Wilkins or approved equal. Assemblies shall be on "List of Approved Assemblies", by the Oregon Health Authority, Oregon Drinking Water Services, Cross Connection & Backflow Prevention.
2. Description: Shall be the reduced pressure principle assembly model as indicated on drawings or approved equal.

H. Automatic Irrigation Controller

1. Flow Sensing allows for total flow control and break detection (requires flow sensor)
2. Cycle and Soak to eliminate runoff and conserve Water.
3. Four (4) completely independent programs with five (5) start times, for a total of 20 possible start times per day.
4. Watering time (s) for each station can be set from 1 minute to 9 hrs 59 mins in 1 minute increments.
5. Quick Stations allow for rapid programming of a block of stations with the same watering time.
6. Water Days for each program may be based on seven day week or a skip-by-day routine allowing a program to skip from 1 to 30 days between watering.
7. Programmable rain shut down allows the selection of the number of days the controller will stay off (in rain shut down mode) before it goes back into the automatic mode.
8. A "real time" clock holds the actual time during power outages without batteries. This eliminates the need to reset the clock every time the power goes out.
9. Non-volatile memory holds the program (s) indefinitely during power outages or seasonal shutdown
10. No batteries to replace, ever.
11. The Review feature brings all the information for a given program (s) to the displays with simple push of the Review Button.
12. Multiple displays provide a truly simple way of programming and information recall.
13. Manually activated system check/syringe cycle to sequentially run stations for a user selectable time from 1 minute to 9 minutes.
14. Manually activated program cycle to run a program independent of its programmed start time and water days.
15. Manually activated station cycle to run a single station for a selected time.
16. Built-in remote control jack for use with Rain Master Remotes.
17. Automatic field wire fault detection enables the controller to sense a short in the field wire and instantly turn off that station, report the fault and move to the next programmed station. No fuses or reset button to be concerned with.
18. Rain Switch (auto-off) turns off all stations without disturbing the program (s).
19. Available for 120VAC, 50/60 HZ or 220/240 VAC 50/60 HZ power.
20. Heavy duty 18-gauge jet coat, powder coated steel enclosure for outdoor or indoor use.

21. Two convenient sized enclosures for easy installation of field wires.
22. Extra heavy duty lightning and surge protected models available for areas where lightning is a concern.
23. Outdoor pedestal mount available for all models.
24. UL and C-UL approved.
25. Percentage key allows the user to increase or decrease all station run times on a percentage basis in 1% increments from 0% to 300% by program.
26. Comes with a limited 5 year warranty.
27. Setup Operation shall allow the following features to be easily selected or reconfigured by a single push of a button (SETUP key): Programmable Master Valve/Pump allows the Master Valve or Pump to go on by program; Programmable stacking or no stacking of programs selects programs to run one after the other (Stack Mode) or at the same time (No Stack Mode); Programmable timer delay between stations establishes a time delay from 1 second to 256 seconds (4 minutes 16 seconds) to allow slow-closing valves to completely shut off; Programmable security code allows entry of a 1 - 4 digit number as a security code to prevent access by unauthorized personnel; Programmable sensor to enable or disable sensor operation for each program; Programmable alarm to either enable or disable an audible alarm in the event of a field wire fault.
28. Electrical Specifications: Input power required: 105-130 VAC, 50/60 Hz, .5 Amp maximum, .1 Amp idle. Output power: 24 VAC, 1.5 Amps maximum total output (36VA) 1 Amp per station or Master Valve.
29. Rain/Freeze Shut-off Sensor
  - a. The sensor shall be capable of interrupting the power from the irrigation controller to the valves when rainfall exceeds a pre-selected amount, or when ambient air temperature falls below 37 degrees Fahrenheit (3 degrees Centigrade).
  - b. The sensor shall be of a two-piece configuration with a transmitting unit and a receiving unit. The receiving unit shall be wired directly to the irrigation controller and mounted in close proximity to the controller. The transmitter unit may be mounted up to 1000 feet away from the receiver. The receiver unit shall also have a built-in bypass switch to allow for overriding of the sensor. The unit shall be available in a 315 MHz model to meet local codes.
  - c. The rain sensor circuitry shall be housed in an UV and corrosion resistant plastic casing and shall utilize 2 sets of hygroscopic disks to activate switches in the unit. One switch will be for the total rainfall compensation unit and the other for the Quick Response™ unit. The Quick Response™ unit will turn off the irrigation system within 5 minutes of the onset of precipitation, depending on the intensity.
  - d. The sensor shall be adjustable by turning a plastic collar on the device that regulates an opening, thus varying the rate of evaporation from the disks.

- e. The freeze sensor circuitry shall be housed in a UV and corrosion resistant plastic casing and the sensing element shall be encased in epoxy. The switch shall be rated at 24 VAC, 6 amps.
  - f. The sensor shall have an integral, adjustable, aluminum, mounting bracket that allows installation on angled, as well as perpendicular surfaces. The sensor shall have a mounting option that allows for installation on a rain gutter.
- I. Control Wiring
1. Connection between the automatic controllers and the electric control valves shall be made with direct burial copper with AWG-U.F. 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with different color strip for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than: Pilot wires to be minimum size to be #14-1 UF. Common shall be a minimum size to be #12-1 UF. Wire to be sized according to distance and demand.
- J. Waterproof Connectors
1. Waterproof connectors to be Spears DS-400, prefilled Dri-Splice Wire Connector with crimp sleeves or approved equal for use with waterproof under-ground wire connections.
  2. Wire connector shall be pre-filled with dielectric silicone sealant.
- K. Valve Boxes
1. Manufacturer: Christy Concrete or approved equal.
- L. Quick Coupler Valve
1. Quick coupling valves shall be as indicated on drawings or approved equal and shall be two (2) piece brass construction one-inch (1") angle slot type with locking yellow rubber cover, capable of withstanding working pressure of 125 psi without leakage.
- M. Remote Control Valves
1. The valve shall be a normally closed, electronically-actuated, diaphragm-operated, remote-control valve.
  2. The valve shall be available in a globe configuration with 1-,1-1/2- or 2-inch models. All valve models will have Female National Pipe Thread (FNPT) inlets and outlets. The valve shall be equipped with a flow control mechanism with removable handle that will regulate flow from full on to completely off.
  3. The body and bonnet shall be molded of non-corrodible, glass-reinforced nylon, rated to 220 PSI. The body of the valve shall have brass inserts, with through-holes, which will accept the bonnet bolts. The bonnet bolts shall be serviceable with a slotted screwdriver, Phillips screwdriver, or a hex wrench, and shall be held captive in the bonnet when the bonnet is

- removed from the valve body. The diaphragm assembly shall be of molded construction, reinforced with nylon fabric and have a thermoplastic elastomer seating material. The valve shall be equipped with an internal filter as well as a self-cleaning metering rod, so only clean water can enter the solenoid chamber. An optional filter cleaning system, that cleans a stainless steel filter each time the valve opens and closes, shall be available. All metal parts internal to the valve shall be manufactured from corrosion-resistant stainless steel.
4. The valve shall be available with an optional adjustable pressure regulating device with a calibrated dial for setting of the outlet pressure. The regulator shall be capable of adjusting the outlet pressure from between 20 and 100 PSI when inlet pressure is 15 PSI or greater than regulated outlet pressure. The regulated downstream pressure shall remain constant regardless of variations in upstream pressure. The regulation shall be maintained when valve is manually operated with use of internal bleed valve. The regulator should be capable of regulating upstream pressures from 35 psi to 220 psi.
  5. The standard solenoid shall be a 24 VAC unit with a 350 mA inrush current and 190 mA holding current at 60 cycles and a 370 mA inrush current and 210 mA holding current at 50 cycles. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open.

N. Drip Control Zones

1. The kit shall consist of two factory-assembled parts; the electric valve, the filter/regulator assembly.
2. The valve shall be a normally closed, electronically-actuated, hydraulic, remote-control valve. The valve will be capable of operating between 20 - 120 PSI with a flow range of between 0.5 - 15 GPM / 30 - 900 GPH.
3. The valve shall be a normally closed, electronically-actuated, hydraulic, remote-control valve. The valve shall be equipped with a non-rising stem-type, manual flow control mechanism. This mechanism will be operable by hand that will regulate flow from full on to completely off. When specified for use with reclaimed water, a reclaimed water identifier handle shall be available.
4. The standard solenoid shall be a 24 VAC unit with a 350 mA inrush current and 190 mA holding current at 60 cycles and a 370 mA inrush current and 210 mA holding current at 50 cycles. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open. The valve shall have an external manual bleed screw that provides an additional method for manual operation of the valve.
5. The body and bonnet shall be molded of non-corrodible, glass-reinforced nylon, rated to 220 PSI. The body of the valve shall have brass inserts, with through-holes, which will accept the bonnet bolts. The bonnet bolts shall be serviceable with a slotted screwdriver, Phillips screwdriver, or a hex wrench, and shall be held captive in the bonnet when the bonnet is removed from the valve body. The diaphragm assembly shall be of molded construction,

- reinforced with nylon fabric and have a thermoplastic elastomer seating material. The valve shall be equipped with an internal filter as well as a self-cleaning metering rod, so only clean water can enter the solenoid chamber. All metal parts internal to the valve shall be manufactured from corrosion-resistant stainless steel. A perforated diaphragm support ring shall fit into the valve body just below the diaphragm to relieve stress on the diaphragm when the valve is closed.
6. The valve shall have a 1-inch Female National Pipe Thread (FNPT) inlet and outlet. All valve parts shall be serviceable after installation by unscrewing the bonnet bolts and removing the bonnet from the valve body to access the internal components. This may be accomplished without removing the valve body from the line.
  7. The filter/regulator shall be a combination filter and pressure regulator assembly. The filter/regulator will be capable of operating between 20 - 120 PSI with a flow range of between 0.5 - 15 GPM / 30 - 900 GPH. The downstream pressure shall be 40 PSI.
  8. The filter/regulator shall be available in an in-line configuration. The filter/regulator will have a 1-inch Male National Pipe Thread (MNPT) inlet and ¾-inch Female National Pipe Thread (FNPT) outlets.
  9. The housing and regulator shall be molded of non-corrodible PVC, rated to 150 PSI. All internal portions of the assembly shall be of molded construction and shall have durable materials that are non-destructible in severe conditions.
  10. The filter/regulator shall be equipped with a 150-mesh stainless steel filter, so only clean water can be discharged through the regulator. The filter assembly must have removable cap for easy service and cleaning.
  11. The filter/regulator shall be standard with a non-adjustable pressure-regulating device that is factory calibrated for the correct outlet pressure. The regulator shall be capable of reducing the outlet pressure to 25 or 40 PSI depending on the specified model when the inlet pressure is 15 PSI or greater than the regulated outlet pressure. The regulated downstream pressure shall remain constant regardless of variations in upstream pressure.
  12. The valve and filter/regulator assembly shall be rated for use up to 120 degrees F.

O. Tree Water Systems

1. The Root Zone Watering System shall be pre-assembled, and constructed of a plastic mesh tube with a removable, perforated end cap. It shall have an internal baffle system to aid in dispersing the water throughout the root zone. When specified with an integral bubbler, it shall be attached to a pre-fabricated ½-inch, male threaded swing joint. The bubbler options shall be a 0.25 GPM pressure compensating bubbler. A filter fabric sleeve shall be available for field installation, for use in sandy soil conditions. The system shall be 36-inch in height and provided with an adjustable check valve as indicated on plans.

P. Dripline

1. Dripline shall be a self-cleaning, pressure compensating. This low volume dripline shall have integral and evenly spaced pressure compensating emitters welded to the inside of the tubing that contains recycled content. Dripline emitters discharge rate shall be gallons per hour indicated on the plans. Drip line emitters shall be spaced as indicated on the plans. Dripline shall be available in 1,000' coils.
2. Dripline shall be nominally sized to 17mm (½") low-density linear polyethylene tubing with recycled content qualifying for maximum LEED credits. It shall be constructed with pressure compensation, and be continuously self-cleaning. The exterior of the tubing shall be brown in color and conform to an outside diameter (O.D.) of 0.66 inches and an inside diameter (I.D.) of 0.56 inches. Individual pressure compensating emitters shall be welded to the inside wall of the tubing as an integral part of the manufacturing process. These emitters shall be constructed of a two (2) piece plastic emitter housing containing a continuously self-flushing molded silicone diaphragm. The emitter shall be installed into the tubing so that the inlet to the emitter is toward the center of the tubing cross section.
3. Each emitter shall have the ability to independently regulate discharge rates, with an inlet pressure range of 6 - 58 pounds per square inch (psi), at a constant rate of flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 6 - 58 psi. The emitter discharge rate shall utilize a combination of turbulent flow and reduced pressure compensation by molded silicone diaphragm. The emitters shall be capable of continuously cleaning themselves while in operation. Maximum system pressure shall not exceed 58 psi for maximum fitting integrity. Filtration shall be 120 mesh or finer. Bending radius shall not be smaller than 7" or tubing kinking may result.
4. For on-surface or under mulch installations, 6" metal wire staples shall be installed 3'-5' on center, (depending on soil type) and two staples shall be installed over every change-of-direction fitting

Q. Air/Vacuum Relief Valve

1. Air/ vacuum relief valve shall be an O-ring seal type with inlet threads of ½-inch (MIPT) capable of venting air until 4 PSI is achieved at system startup and vacuum relief when 4 PSI is reached during system shutdown.
2. The air/ vacuum relief valve shall be rated at a maximum operating pressure of 100 PSI. The air/ vacuum relief valve body and shuttle shall be constructed of corrosive-proof engineering thermoplastics.
3. The seal shall be a rubber O-ring.
4. The Air/Vacuum Relief Valve shall be as specified on the plans or approved equal.

R. Manual Flush Valve

1. Manual flush shall be schedule 40 PVC ball valve.

S. Electrical Requirements to Automatic Controller (120V)

1. Service to automatic controllers and final hook up shall be provided by electrical subcontractor.
2. Electrical equipment installed outside building shall be NEMA 4 type.
3. All connections between electrical services and equipment shall be in rigid galvanized electrical conduit, with conduit and wiring size as required.
4. To be complete in every respect to National Electrical Code, ready for use and in accordance with manufacturer's requirements. Provide separate power shut-off switch at panel for each controller. All wiring in galvanized conduit and fittings from source provided under the electrical section. No running threads accepted; use nipples. Conduit system shall be 660-volt insulation, NEC standard annealed copper wire and shall be minimum AWG #12 TW or RW. Protect each controller by a code approved ground connection. Supply to be 120 volts, 60 cycle, single phase, one amp. Use only galvanized steel fasteners in securing controllers in position. Install new controller as detailed on drawings.

T. Additional Materials

1. Primer: Shall be IPS Corporation Weld-on #P-70, or approved equal
2. Cement:
  - a. IPS Corporation Weld-on #P-705 for Class 200 PVC or Schedule 40 PVC (up to six inches (6") diameter). IPS Corporation Weld-on #711 shall be used for larger pipe diameters and Schedule 80 PVC, or approved equal.
  - b. IPS Corporation Weld-on #P-795 for flexible PVC to rigid PVC connections, or approved equal.
3. Pipe Joint Compound
  - a. Joint compound to be non-hardening, formulated for threaded connections on water carrying pipe, Lasco Blue Pipe thread sealant or approved equal.
4. Pipe Thread Tape
  - a. Pipe thread tape shall be 100% virgin Teflon pipe thread tape.
5. Corrosion Protection
  - a. Provide polyethylene wrap a minimum of six (6) mils. Thickness for all metal pipe, fittings, tie-rods, valves, and other appurtenances. The raw material must meet or exceed: Type 1, Class A Grade E-1, in accordance with ASTM Standard Designation D-1248; a tensile strength of 1,200 PSI minimum; elongation of 300% minimum and dielectric strength of 800V/Mil thickness minimum.
6. Remote Control Valve Identification Tags

- a. 2-1/4 by 2-3/4-inch yellow polyurethane with valve number embossed on tag
7. Trench Backfill Material:
  - a. Sand shall be a utility sand white in color and jetted lightly after being placed in trench. Sand backfill shall be used for all pressure mainline pipe.

### PART 3 - EXECUTION

#### 3.01 OBSERVATION OF SITE

##### A. Site Conditions

1. The Contractor shall carefully check all grades to verify that it is safe to proceed with work on the irrigation system.
2. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and shall report any variations to the Agency's Representative.
3. Prior to starting work, test and verify that water pressure levels meet the requirements specified on the Drawings. Notify the Agency's Representative immediately of any discrepancies.
4. Ambient Conditions:
  - a. PVC shall not be cemented during wet conditions per the discretion of the Agency's Representative.
  - b. Trench excavation and backfilling shall not be performed during excessively wet conditions per the discretion of the Agency's Representative.

#### 3.02 PREPARATION

##### A. Physical Layout

1. The irrigation system design and layout shall be developed by the Contractor and approved by the City prior to execution.
  - a. Irrigation plans are diagrammatic. Pipe lines shown parallel in the Drawings may be placed in a common trench, provided that a minimum horizontal distance of three inches (3") is maintained between buried lines.

##### B. Protection of In-Place Conditions

1. Surrounding areas, surfaces and appurtenances already in place shall be protected during installation of planting irrigation.

2. Exercise care in excavation and working near existing utilities. Check existing utility locations. Contractor shall be responsible for damages caused during his operations to any existing underground utility lines including existing irrigation control wires, storm sewers, sanitary sewer systems, gas lines, potable water lines, irrigation lines, telephone cables, gasoline or oil lines, electrical cables, or any other systems (buried or overhead). If such damage should occur, Contractor shall immediately notify Landscape Architect, Owner, and department affected by such damages and shall pay all ensuing costs

C. Grading

1. Contractor shall be responsible for installing all irrigation features to their finished grade and at depths indicated. All rough grading shall be completed before trenching commences.

D. Coordinate installation of the sprinkler irrigation materials, including pipe, so there shall be no interference with the utilities or other construction or difficulty in planting trees, shrubs and ground covers.

E. Do not proceed with work until unacceptable site conditions are corrected or existing utilities are located and/or marked out in field.

1. Contractor shall be responsible for installing all irrigation features to their finished grade and at depths indicated. All rough grading shall be completed before trenching commences.

F. Protection:

1. Provide barricades, coverings, warning signs, lights and other protection required by local code or OSHA to prevent damage to existing improvements to remain and protect the public.
2. Protect improvements on adjoining areas as well as those on the project site.
3. Restore any improvements damaged by this work to original condition, as acceptable to OWNER'S REPRESENTATIVE or other parties or authorities having jurisdiction.

3.03 GENERAL

- A. All work shall conform to State and local codes, latest version. All irrigation and potable water piping installation shall be installed to meet requirements for present or future recycled water use. Refer to the plans and these specifications for required materials and proper installation procedures for potable water piping installation.
- B. Details of installation and construction shall conform to the plans and these specifications.
- C. The Contractor shall install the specified pipe, valves, fittings, wiring, switches, controls, and appurtenances at the approximate locations indicated on the plans.

### 3.04 TRENCHING

- A. Constant pressure recycled water pipelines shall be located a minimum of twelve inches (12") below the potable water pipelines. Lateral recycled water pipelines (non-pressure) are allowed over potable pipelines with a minimum of twelve inches (12") vertical separation.
- B. Trenches for pipe and electrical conductors may be excavated manually or with mechanical trenching equipment. Mechanical trench diggers used on the site shall be essentially vertical so that a minimum of surface is disturbed. Road patrols or graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Trenches for pipe shall be excavated to the depth shown on the plans.
- C. Excavate trenches with vertical walls, uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on bottom. There shall be a minimum three inch (3") vertical clearance between all pipes,
  - 1. No lines shall be installed parallel to and directly over another line.
  - 2. When lines must cross, the angle shall be forty-five to ninety degrees, and a minimum of three inches (3") clearance shall be maintained.
- D. Coverage: Provide minimum coverage depths as follows:
  - 1. Mainline: Twenty-four inches (24") in landscape areas, thirty inches (30") under paving.
  - 2. Lateral Lines: Eighteen inches (18") in landscape areas, thirty inches (30") under paving.
  - 3. Provide a minimum cover of 24 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under all paving. Sleeves as per specifications
- E. Trenches located under areas where decomposed granite paving, asphaltic concrete paving, concrete paving, or concrete walks will be installed shall be backfilled with sand (a 6-inch layer below the pipe and 6-inch above the pipe) and compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to beginning work
- F. Hydraulic driving methods shall not be used under paved surfaces.

### 3.05 PIPE INSTALLATION

- A. Carefully inspect all pipe and fittings before installation, removing dirt, scale, and burrs and reaming; install pipe with all markings up for visual inspection and verification.
- B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings; store plastic pipe and fittings under cover until ready to install; transport plastic pipe on a vehicle with a bed

long enough to allow the pipe to lay flat, avoid undue bending and any concentrated external load.

- C. Remove all dented and damaged pipe sections.
- D. All lines shall have a minimum clearance of 6 inches from each other and 12 inches from lines of other trades.
- E. Parallel lines shall not be installed directly over one another.
- F. Center-load pipe with approved backfill to anchor pipe before testing to prevent pipe from moving under pressure. Do not cover couplings and fittings.
- G. All threaded plastic-to-plastic connections shall be assembled using Teflon tape.
- H. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal connections, except where noted otherwise.
- I. Solvent Weld Joints: Contractor shall use only the solvent supplied and recommended by the manufacturer to make plastic pipe joints.
  - 1. The pipe and fittings shall be thoroughly cleaned of dirt, dust, and moisture before applying solvent.
  - 2. The Contractor will make solvent weld joints with non-synthetic bristle brush in the following sequence:
    - a. Apply a liberal even coat of purple-colored PVC primer to the pipe and fittings immediately prior to applying the solvent.
    - b. Then apply a liberal even coat of solvent to the inside of the fittings and then to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.
    - c. Insert the pipe quickly into the fitting and turn the pipe approximately one fourth (1/4) turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen (15) seconds so the fitting does not push off the pipe.
    - d. Use a clean rag and wipe off all excess solvent. This is to prevent weakening at joint.
    - e. Be sure that in going to the next joint, the pipe is not twisted, disturbing the last completed joint.
    - f. Allow at least fifteen (15) minutes set up time for each welded joint before moving.
- J. Threaded Connections for Irrigation Heads and Remote Control Valves
  - 1. For all PVC threaded connections, use Teflon tape only. In no event shall an oil base joint compound be used on a PVC joint. On plastic to steel connections, the Contractor shall work the steel connections first.

2. All PVC swing joints shall move freely upon installation.

K. Installation of Pipe

1. The Contractor shall provide the necessary mason's lines and supports to ensure installation of the pipe to line and grade, as staked by the Engineer. The Contractor's facilities for lowering the pipe into the trench shall be such that neither the pipe nor the trench will be damaged or disturbed.
2. All pipes shall be assembled free from dirt and pipe scale and shall be reamed, and burrs removed. The main line supply shall be flushed out and tested for leaks before backfilling and with control valves in place and before lateral pipes are connected to valves. Each section of lateral pipes shall be flushed out before sprinkler heads are attached.
3. Plastic pipe will expand approximately six inches (6") per thousand feet (1,000') between day and night temperatures in hot climates. Therefore, pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction.
4. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into position in the trench, and it shall be kept clean by approved means during and after laying of pipe

L. Installation of Pipes Under Paving

1. Where irrigation mains or laterals are to be installed under paving, a Class 200 or Class 315 sleeve shall be installed, depending on the size. The inside diameter of the sleeve shall be a minimum of two inches (2") larger than the outside diameter of the main, lateral, or sleeve, whichever is greater.
2. A separate sleeve shall be installed for irrigation control wires. The minimum diameter shall be two inches (2").
3. All trenches for sleeving must be compacted to 95% compaction using manual or mechanical taping device.
4. Contractor shall be responsible for the installation of all sleeves required for the irrigation system not listing in the drawings.
5. Bore for sleeves under obstructions that cannot be removed. Employ equipment and methods designed for horizontal boring.

3.06 BACKFLOW PREVENTION DEVICE

- A. Backflow preventer shall be accessed and have clearance for the required testing, maintenance and repair. Access and clearance shall require a minimum of one (1) foot between the lowest portion of the assembly and grade, floor or platform.
- B. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

- C. All backflow preventers shall be tested and certified for proper operation prior to being placed in operation.

### 3.07 HIGH VOLTAGE WIRING FOR AUTOMATIC CONTROLLERS

- A. 120-volt power connection to the automatic controller from electrical source connection shown on electrical drawings shall be provided by Contractor.
- B. All electrical work shall conform to local codes and ordinances and shall be in accordance with the National Electrical Code, most recent edition.

### 3.08 LOW VOLTAGE WIRING

- A. Place wiring in the same trench and routing as pressure supply lines.
- B. Install wiring alongside main line. Bundle and tape to side of main line at an interval of 10 – feet on center. Install wires in conduit from controller location to main line.
- C. When more than one wire is placed in a trench, tape wires together at maximum 10foot intervals.
- D. Provide a 24-inch expansion loop at each connection and directional change.
- E. Use a continuous wire between controller and remote control valves.
- F. Except as otherwise approved, do not splice wire at any point.
- G. At locations where splicing is allowed, make splices within an acceptable splice box.
- H. Provide each controller with separate ground wire.
- I. A spare control wire of a different color shall be looped through every valve on the system.

### 3.09 AUTOMATIC CONTROLLER

- A. Install as per manufacturer's instruction. Remote control valves shall be connected to controller in numerical sequence as shown on drawings.

### 3.10 DRIPLINE IRRIGATION

- A. Contractor shall layout dripline, etc. for approval from OWNER'S REPRESENTATIVE.
- B. Layout drip systems and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.
- C. Check headers (manifolds) and dripline laterals for leaks before covering with soil.

- D. Check pressure at the site and be sure to operate below the maximum rated pressure of 58 PSI. Check and record pressure at the supply header and flush header. Any changes in pressure can be used in future troubleshooting.
- E. Be sure there is uniform soil compaction all over the site after installation.
- F. After installation, open the flush valves (one at a time) and collect some of the water to check to be sure that the installation is clean.
- G. Allow for expansion and contraction of tubing.
- H. Tie-Down Stake
  - 1. Stagger stakes every 3 feet in sand, 4 feet in loam, and 5 feet in clay.
  - 2. At fittings where there is a change of direction such as tees or elbows, use tie-down stakes close to the fitting on each leg of the change of direction.
  - 3. Insertion plow and trenched installations do not require tie down stakes.
- I. Air/Vacuum Relief Valves
  - 1. Locating at the highest point(s) of the dripline zone.
  - 2. Install the valve in an exhaust header or a line that runs perpendicular to the lateral rows to ensure all rows of the dripline can take advantage of the air/vacuum relief valve.
- J. Manual Line Flush Point
  - 1. Install the manual flush at a low point in the exhaust header of a grid layout, or at the mid-point of a Loop Layout.
  - 2. Install a flush port with a threaded plug or a manual flushing valve in a valve box with a gravel sump adequate to drain approximately one gallon of water.
  - 3. Manual flush points are normally installed as far away from the water source as possible.
- K. Dripline Flushing
  - 1. After all dripline feeder lines and risers are in place and connected, all necessary diversion work has been completed, and prior to the installation of any dripline, the control valves shall be opened and a full head of water used to flush out the lines and fittings.
  - 2. Subsurface dripline shall be installed after flushing the system has been completed. Avoid contaminating dripline with debris.
  - 3. Subsurface dripline shall be flushed prior to the installation of all flush valves.
  - 4. Flush the system every two weeks for the first 6 weeks and check the water that is flushed out for cleanliness.

5. Establish a regular flush schedule for the future after these initial checks.
6. Flush the system well after any repairs are made.
7. Check the pressure at the supply and flush headers on a regular basis and compare with the pressure readings taken right after installation.

L. Winterization

1. Winterizing an irrigation system involves removing enough water to ensure that components are not damaged due to freezing weather.
2. Check the manufacturer's instructions for winterizing the valves, filters and backflow prevention devices.
3. If compressed air is used to blowout the lines:
  - a. Compressed air may be used only be used with the flush valve open and with the air pressure at 40 psi or less.
  - b. Drip fittings are rated to 50 psi, so the air pressure must be adjusted below this pressure.
  - c. It is air volume, not pressure, which is effective when blowing out the lines.
  - d. The pressure-regulating valve that is part of the control zone regulates water, not air pressure.
  - e. With all drain ports open, compressed air should be applied until no water is seen exiting the ports.
  - f. After turning off the air, close all drain ports.

3.11 OTHER EQUIPMENT

- A. Hydrometer shall be installed per the detail as shown on the Plans and per the manufacturer's recommendations. Units shall be installed horizontally with the register facing upward only. Hydrometer must be installed so that the pipe will be full of water at all times during metering. Particular attention shall be paid to the depth of the installation from the top of the meters to finished grade. Register lid shall remain closed during normal operation in order to assure protection from the elements and proper accuracy for the output signal.
- B. Remote Control Valves (RCV)
  1. Shall be installed as shown on the plans. Particular attention shall be paid to the depth of the installation from the top of the valve to the bottom of the valve box lid.
  2. Contractor shall tag all remote control valves indicating the number of the station in relation to the irrigation controller and irrigation plan.

C. Installation of Conductor in Trenches

1. Under no circumstances shall a splice be allowed other than within a remote control valve box or other pull box as shown on the plans and no additional splice boxes shall be allowed without the written approval of the Agency's Representative.
2. Not less than one (1) foot of cable slack shall be left on each side of all splices at all points where cable is connected to field equipment. The slack cable shall be placed in the trench in a series of S curves.
3. The contractor shall install four (4) 14-gauge wires from the master valve and flow sensor to the irrigation controller inside of a 1 inch electrical PVC conduit.
4. The wires shall be spliced inside of a #3-1/2 pull box at two hundred feet (200') maximum interval between the master valve and flow sensor and the controller.

D. Installation of Locator Wires

1. Strap the locator wire to the top of all main lines and quick coupling valve lines every ten feet (10').
2. One locator wire is required in every main line and quick coupling valve line trench, spliced per detail.
3. Loop locator wires up into each valve box and attach a plastic identification marker onto the locator wire with a nylon tie.

E. Quick coupling valves shall be installed on a swing joint assembly as per manufacturer's written recommendations

F. Installation of Root Watering Systems

1. Root Watering Systems in open areas shall be installed at least four inches (4") above finished grade at the time of installation. Within five (5) days of notification by the City, Contractor shall, as part of the work under this contract, make whatever adjustments of pipe, fittings, valves, or sprinkler heads necessary to bring the system to the proper level of the permanent grade. At this time, heads shall be made completely firm with sand.

G. Valves and Valve Boxes

1. Provide at all locations indicated. Install only one valve per box, minimum 6" clearance from bottom of valve to soil level. Valve must be fully enclosed within box allowing space for maximum opening of flow control.
2. When grouped together allow at least 12 inches between valves.
3. Fill area under box at each corner with supporting brick.

4. All remote control valves to be installed with SCH 80 threaded fittings, with ball valve and union. To be threaded from main.
5. Contractor shall brand all valve boxes.

### 3.12 BACKFILLING

- A. The procedure for backfilling shall be the same for trenches with pipe only, conductor only, both pipe and conductor only, or both pipe and conductor or conduit and conductor.
- B. All lumber, rubbish, and large rocks shall be removed from the trenches. Pipe shall have a firm, uniform bearing for the entire length of each pipe line to prevent uneven settlement. Wedging or blocking of pipe shall not be permitted.
- C. After the pipe and/or conductor have been installed, the trench shall be backfilled to the level shown on the plans with white sand as shown on the plans.
- D. The remainder of the backfill shall be topsoil material, which shall not be less than eight inches (8") deep.
- E. Backfill shall be mechanically compacted in 4-inch layers under the pipe and uniformly on both sides for full width of the trench and full length of the pipe in landscape areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities. Materials shall be sufficiently damp to permit thorough compaction, free of voids.
  1. Backfill: Free of rocks over 2 inches, metal and trash.
  2. Sand bedding for pressured pipe: Not less than 6 inches below and above pipe. Note: Avoid introduction of dissimilar materials, which may result in a galvanic reaction.
- F. Trenches shall not be excessively wet and shall not contain pools of water during backfilling operations.
- G. Flooding of trenches will be permitted only with the approval of OWNER'S REPRESENTATIVE.
- H. Jetting and settling of trenches is preferred.
- I. If settling occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to Owner.
- J. Under no circumstances shall truck wheels be used to compact soil
- K. Extreme care shall be exercised by the Contractor while backfilling. Any materials or equipment damaged while backfilling shall be repaired or replaced by the Contractor as directed by the Engineer, at no cost to the City.

### 3.13 FLUSHING

- A. After all irrigation lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush clear and clean all dirt and foreign material. Mains shall be flushed prior to backfilling.

### 3.14 ADJUSTING THE SYSTEM

- A. The Contractor shall flush and adjust all bubbler heads and drip emission devices for optimum performance.
- B. If it is determined that adjustment in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include installation of additional drip emission devices as required.
- C. Lowering raised deep root watering systems by the Contractor shall be accomplished within 10 days after notification by Owner.
- D. The entire system shall be operating properly before any planting operations commence.

### 3.15 TEMPORARY REPAIRS

- A. The City reserves the right to make temporary repairs as necessary to keep the irrigation system in operating condition. The exercise of this right shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified. Existing landscape areas and irrigation system retained are the responsibility of the Contractor through Completion.

### 3.16 SITE QUALITY CONTROL

- A. Hydrostatic Pressure Tests
  - 1. After flushing, mains shall then be submitted to a leakage test. All tests on pressure lines shall be completed prior to backfilling; however, sufficient sand shall be placed in trenches between fittings to insure the stability of the line under pressure. In all cases, fittings and couplings must be open to visual inspection for the full period of the test. No testing shall be done until the last solvent welded joint has had twenty-four (24) hours to set and cure.
  - 2. Do not install remote control valves, quick couplers, or any other valve assembly until testing of pressure main lines has been accepted by the Engineer.
  - 3. All control valves shall be closed. The sprinkler system main shall be slowly filled with water to line pressure.
  - 4. Before testing, all air shall be expelled from the pipe.

5. Center-load pipe with approved backfill to anchor pipe before testing to prevent pipe from moving under pressure. Do not cover couplings and fittings.
6. Where any section of the pipe system is provided with a concrete thrust block, the test shall not be made until at least five (5) days have passed after the concrete thrust block was installed. If higher early-strength cement is used in the concrete thrust block, the test shall not be made until at least two (2) days have elapsed.
7. The duration of each test shall be four (4) hours, and during the test, the system shall be subjected to 150 psi line pressure.
8. Observe pressure loss on pressure gauge. If pressure loss is greater than 5 PSI, identify reason for pressure loss. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until pressure loss is equal to or less than 5 PSI
9. Should any section of pipe laid disclose leakage, locate and repair defective pipe or joint and retest to the satisfaction of the Engineer.
10. Visually inspect irrigation pipe for leakage and replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until pipe passes test.
11. Cement or caulking to seal leaks is prohibited.

B. Pressure Line Observation

1. Prior to any backfilling of any trench(s) Contractor shall call for field observation for verification of material, depths, clearances, and tracer wire by the OWNER'S REPRESENTATIVE.
2. Any trenching covered that was not inspected or approved shall be made visible for observation at the cost of the Contractor.

C. Lateral Line Testing

1. Prior to backfilling of any trench(s) Contractor shall call for field observation for verification of material, depths and clearances by the OWNER'S REPRESENTATIVE.
2. All deep root watering systems and assemblies shall be made visible for observation for verification that all material has been installed per plans and specifications.
3. Any trenching covered that was not inspected or approved shall be made visible for observation at the cost of the Contractor.

D. Coverage Tests

1. Perform coverage tests after all systems are completed and operational, after finish grading (Refer to Section 329100, Planting Preparation) has been completed, but prior to any planting, in the presence of the Engineer.

2. Activate each remote control valve in sequence from controller. Provide either one additional personal with radio or use handheld remote to activate remote control valves from controller. Manually activating remote control valve using manual bleed mechanism at remote control valve is not an acceptable method of activation. OWNER'S REPRESENTATIVE will visually observe operation, water application patterns, and leakage. All irrigation deep root watering systems and drip systems must provide adequate coverage. Any areas not receiving adequate coverage shall be corrected and retested per the OWNER'S REPRESENTATIVE.
3. Replace defective remote control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
4. Replace, adjust, or move water emission devices to correct operational or coverage deficiencies.
5. Replace defective pipe, fitting, joint, valve, bubbler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
6. Repeat test(s) until each lateral passes all tests. Repeat tests, replace components, and correct deficiencies at no additional cost to Owner.
7. Correct all deficiencies to the satisfaction of the Engineer prior to planting.

E. Valves

1. The Contractor shall adjust all remote control valves to close within forty-five (45) seconds to one minute upon shut-down from the irrigation controller.

F. Automatic Irrigation Control System Grounding

1. Test for proper grounding of control system per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance.
2. Automatic Irrigation Control System shall be grounded and conform to requirements of the National Electric Code, current edition as adopted by local code, and the manufacturer's specifications. No solder connections will be allowed. Resistance to ground shall be no more than 25 ohms.
3. Test to verify proper grounding.
4. Replace defective wire, grounding rods, grounding plates, or appurtenances. Repeat test until manufacturer's guidelines are met.

G. Tracing Wire Test

1. Pass current through wire and demonstrate that wire is capable of locating the pipe.
2. If wire will not pass current, locate break and test until tracing wire works in accordance with its intended use.

H. Final Irrigation Inspection

1. All irrigation systems shall be tested in the presence of the OWNER'S REPRESENTATIVE and under complete automatic operation and proven to be leak free, irrigating designated areas per plans and specifications with least amount of over spray as possible.
2. Contractor shall provide as-built record drawings and controller charts at final irrigation inspection for approval prior to Mylar transfer and laminating.
3. All irrigation turn over items shall be turned in to the OWNER'S REPRESENTATIVE prior to the start of maintenance.

I. When the irrigation system is completed, perform a coverage test in the presence of the OWNER'S REPRESENTATIVE to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plan, or where the system has been willfully installed as indicated on drawings when it is obviously inadequate, without bringing this to the attention of the OWNER'S REPRESENTATIVE. This test shall be accomplished before any ground cover planting is planted

1. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

3.17 CLEAN-UP

- A. Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from site. All walks and paving shall be broomed or washed down, and any damage sustained to the work of others shall be repaired to original conditions acceptable to the City.

3.18 OBSERVATION PRIOR TO COMPLETION

- A. The Contractor shall be responsible for notifying the City in advance for the following minimum observations. Contractor shall specifically request observations with five (5) working days minimum notices:
  1. Pre-Construction Conference
  2. Layout of system.
  3. Points-of-connection excavation.
  4. Trenching and pipe assembly.
  5. Pressure testing of mains and laterals.
  6. Coverage adjustments of all heads prior to planting.
  7. Valve box installation.

8. Controller installation
  9. Complete system punch list
  10. Beneficial Occupancy observation
  11. Warranty period punch list
  12. Final irrigation system observation
  13. Operation of system, pre-maintenance
- B. The Contractor shall operate each system in its entirety for the OWNER'S REPRESENTATIVE at time of final observation. Any items deemed not acceptable shall be reworked at no additional contract cost, to the complete satisfaction of the City.
- C. The Contractor shall show evidence to the City that the City has received all accessories, charts, Record Drawings and equipment as required before final observation can occur.
- D. No final observation shall commence without Record Drawings completed. No further observations will be scheduled until the Record Drawings have been completed.

### 3.19 GUARANTEE

- A. The Contractor shall guarantee the entire irrigation system against defects in materials and workmanship for a period of one (1) year from the date of acceptance of the work. The Contractor shall furnish a Faithful Performance Bond in the amount of 10% of the amount bid for the installation of the irrigation system to be in force for the one (1) year guarantee period.
- B. A copy of the guarantee form shall be provided at the time of contract award and shall also be included in the Operations and Maintenance Manual.
- C. A copy of the guarantee form shall be provided at the time of contract award and shall also be included in the Operations and Maintenance Manual

#### GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee that the irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the Drawings and Specifications. We agree to repair or replace all defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replace all damages resulting from the repair of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of

written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense, and we will pay the costs and charges therefore upon demand.

PROJECT\_  
LOCATION: \_\_\_\_\_  
CONTRACTOR/COMPANY:\_  
LICENSE NO. \_  
ADDRESS\_  
PHONE\_  
DATE OF FINAL ACCEPTANCE\_  
SIGNED:  
DATE:

- END OF SECTION -

## SECTION 32 90 00 - PLANTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. The Work of this Section includes furnishing labor, materials, equipment, and supplies and performing operations required and as defined herein and as shown on the Plans, including without limitation:
  - 1. Coordinating with other work
  - 2. Procurement, layout and installation of specified plants
  - 3. Inspection and removal of noxious and invasive weeds prior to planting
  - 4. Tree staking materials
  - 5. Applying Mulch
  - 6. Maintenance
  - 7. Sweeping paved surfaces and removing debris prior to leaving the site
  - 8. Providing a warranty on Work and materials
- B. Related Sections
  - 1. Coordinate with related Work specified in other parts of the Project Manual.
  - 2. Coordinate with the General Conditions and Supplemental Conditions in the Contract.

#### 1.2 REFERENCES

- A. Plant Names: Conform to "Report" issued by American Joint Committee on Horticultural Nomenclature Second Edition, 1942, and hereinafter called AJCHN. Names not present in this listing are to conform to accepted nomenclature in the nursery trade.
- B. Quality Standards: As described in the current edition of "American Standard for Nursery Stock" issued by the American National Standards Institute and hereinafter called ASNS.
- C. Reference the following standards:
  - ASNS                      American Standard for Nursery Stock, published by American Hort. Approved National Standard, ANSI Z60.1-2014 Approved April 14, 2014

#### 1.3 QUALIFICATIONS

- A. Landscape Installer: Landscape Installer shall be a company specializing in the Work of this Section with a minimum 5 years documented experience in commercial landscape installation of a similar nature.
- B. Lead Foreman: Landscape Installer to provide at least 1 person as the Lead Foreman who will be present onsite at all times during execution of the Work and who has a minimum 5 years documented experience in commercial landscape installation of a similar nature. The Lead Foreman is required to be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation and is to direct Work performed under this Section.
- C.

#### 1.4 SUBMITTALS

- A. Submit the following information in conformance with submittal procedures noted in Division 01.
  - 1. Landscape Installer and Lead Foreman qualifications.
  - 2. Plant Materials: A complete list of plant materials proposed to be furnished and installed, demonstrating conformance with the requirements in this Section. The list is to include:
    - a. Names, addresses and phone numbers of nurseries and suppliers matched to plants;
    - b. Verification of plant quantities as shown on the Plans;
    - c. Proof of deposit or written assurance from each nursery that the plants have been secured and reserved for the project.
  - 3. Other Materials: Product literature, tear sheets and a complete list of product names and suppliers with addresses and contact information for materials proposed, including but not limited to mulch, tree-staking materials, landscape edging and other miscellaneous materials to be furnished and installed. Submittals are to demonstrate product conformance with the relevant requirements in this Section.
  - 4. Product data, including supplier name and phone number, and 1 gallon representative sample of specified mulch.

#### 1.5 SUBSTITUTIONS

- A. Substitutions of plant materials will not be permitted unless authorized in advance in writing by the Owner's Representative. If proof is submitted that any plant specified is not obtainable submit documentation indicating that a minimum of three suppliers, who regularly grow plants, were contacted.
  - 1. A proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price.
  - 2. Such proof shall be substantiated and submitted in writing to the Owner's Representative a minimum of 45 days prior to start of Work under this section.
  - 3. Landscape Installer to provide a minimum of 2 options for each substitution. Options to be plants of equal character, mature height and cultural requirements.

#### 1.6 REVIEW BY OWNER'S REPRESENTATIVE

- A. Do not schedule review by Owner's Representative until Contractor has confirmed that the relevant requirements of the Plans of this Section have been met. Provide Owner's Representative with a minimum 5 working days' notice when plant materials or plant grouping layout, as applicable, will be ready for review. Obtain Owner's Representative's approval prior to installation of any plant materials in proposed layouts. Any plant materials installed prior to Owner's Representative's approval are subject to relocation at the request of Owner's Representative.
- B. Plant Materials:
  - 1. Upon Delivery: Owner's Representative will review plant materials on site upon delivery for conformance with the requirements of this Section, including plant

specifications, storage and handling requirements. Immediately remove from the site plants which are not true to name or which do not comply with the specified requirements. Replace rejected plant materials with conforming plant material.

2. Balled and burlapped trees: The Owner's Representative may make invasive observation of the plant's root system in the area of the root flare in order to determine that the plant meets the quality requirements for depth of the root flare, presence of roots above the root flare and stem girdling roots. If review indicates excess soil or girdling roots, Owner's Representative may reject plant material or direct corrective actions. This may occur prior to or following planting.
  3. During Construction: Owner's Representative reserves the right to reject plant materials for nonconformance at any time from the delivery of such plant material to the site through the end of the warranty period.
- C. Layout: Owner's Representative will review the layout of plant groupings, trees and other plant materials prior to installation.
- D. Failure to comply with the review and approval procedures described in this Section may require replacement and/or reinstallation of plant materials at no additional expense to the Owner's Representative.

## 2.1 PLANT MATERIALS

- A. General:
1. Plants to be as specified on the Plans.
  2. Plants to be nursery grown in climatic conditions similar to the site. Measurements, caliper, branching, grading, quality, balling and burlapping are to be as specified unless otherwise indicated. Measurements, caliper, branching, grading, quality, balling and burlapping are to follow ASNS unless otherwise specified.
- B. Form:
1. Trees and shrubs to have an overall form typical of the species, uniformly branched, with a symmetrical crown. Trees with curved or leaning trunks, damaged or cut leaders, damaged bark, sunscalds, disfiguring knots or fresh cut limbs over 3/4-inch will be rejected by Owner's Representative.
- C. Plant Size:
1. Plants are to be true to species and variety and be at least equal to the size specified.
  2. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Plant dimensions are to be measured when branches are in normal position. Caliper measurement is to be taken at a point on the trunk 6 inches above the crown of the root ball for trees up to 4 inches in caliper.
  3. Plants larger than specified may be used if approved by the Owner's Representative. Use of such plants shall not increase contract price. If larger plants are used, the ball of earth or container shall be increased in proportion of the size of the plant.
- D. Container Grown:

1. Plants to have been grown and cultivated in the containers in which they are delivered, as an approximate guide, generally for at least 6 months, but not over 2 years. Samples must prove no root-bound conditions exist.
  2. Root-bound plants and container plants that have cracked or broken balls of earth when container or wrappings are removed are not to be planted except upon special approval by Owner's Representative.
- E. Balled and Burlapped (B&B):
1. Plants to have firm, natural balls of soil in sizes shown in ASNS, wrapped firmly with burlap or approved material, and bound carefully with twine, cord, or wire mesh.
  2. B&B material shall not have excess soil material above the root flare or stem girdling roots.
  3. The root flare (i.e. root collar, root crown, trunk flare, flare) is the region at the base of the trunk where the majority of the structural roots join the plant stem, usually at or near ground level.
- F. Damaged Plants: Damaged plants will be rejected. Do not prune plants before delivery.

## 2.2 WOOD CHIP MULCH

- A. Clean wood chip from tree-trimming, composting operations; used as the standard mulch for woody plants. Size shall be ½-inch to 4 inches along the longest dimension. The mulch shall not contain salt, preservatives, glue, resin, tannin, or other compounds in quantities that would be detrimental to plant life.

## 2.3 TREE STAKING MATERIALS

- A. Tree Tie: VIT "Cinch Tie" 1-inch width, or approved equal.
- B. Wood Stakes: 2-inch diameter by 8-foot long Lodgepole pine wood stakes or approved equal.

## 2.4 PROTECTION FOR NEW PLANTING:

- A. New Planting Protection: Protection of all planted areas is required and is the responsibility of the Contractor. Contractor shall provide protection to installed trees, plantings (shrubs, groundcovers, etc.) and turf areas through the maintenance period. Contractor to provide written statement of means and methods for providing new planting protection to Owner's Representative at Pre-installation meeting.

## 2.5 STAKING FOR PLANT/TREE LAYOUT

- A. Staking for tree layout shall be 2-inch x 2" x 36" wood stakes.
- B. Staking for plant layout shall be irrigation flags.
- C. Paint may be used to mark plant layout if weather permits.

### 3.1 GENERAL

- A. Schedule and attend a Pre-Construction meeting with the Owner's Representative. Notify Owner's Representative of the meeting time and location 7 days prior to the meeting.
- B. In general, proceed as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.
- C. Remove debris from other trades prior to beginning work.
- D. Inspect project area for noxious and invasive weeds. Remove noxious and invasive weeds including root wads and crowns prior to planting and dispose of them off site.
- E. Install, maintain, and upgrade protection measures for plant protection plans in locations per plans.
- F. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

### 3.2 PROCUREMENT, DELIVERY, STORAGE AND HANDLING

- A. Procure all trees and plants for the project within timeframes that allows all species to be procured. Provide required offsite secure storage, care and maintenance from the date of procurement, until all tree and plant stock has been delivered, stored and planted on site.
- B. Protect plant materials from wind, drought, unusual weather, dehydration, contamination, heating, wildlife, and vandalism during delivery, storage, and handling. Prevent damage to root balls and leaf desiccation.
- C. Deliver branched plants with branches tied and covered with material that allows air circulation.
- D. Plant Material Storage and Handling:
  - 1. Protect plants from freezing or drying with protective screening and mulching material.
  - 2. Avoid drying or damaging plants being moved from the nursery or storage area to the planting site.
  - 3. Handle balled and burlapped plants carefully to avoid cracking or breaking the root ball.
  - 4. Do not handle individual plants by stem, trunk, limbs, or foliage but only by root ball or other container.
- E. Store non-plant material products in cool dry locations away from contaminants.

### 3.3 PRE-INSTALLATION MEETING AND SITE REVIEW VISITS

- A. Ten (10) working days prior to commencement of Work of this Section, schedule an onsite meeting with the Owner's Representative, Contractor and Contractor's Landscape Installer, and Lead Foreman to review the following:
  - 1. Existing condition of subgrades to receive topsoil. Landscape Installer to accept, in writing, the condition of subgrades prior to subgrade preparation, topsoil placement, tilling and planting operations.
  - 2. Irrigation and planting schedule and potential conflicts with work by other trades.
  - 3. Quality control and maintenance.

- B. Owner's Representative may schedule site visits. No notice required.

### 3.4 PLANT MATERIAL INSTALLATION

- A. Install plant materials in accordance with the Plans.
- B. Standard Details: See Plans for tree planting and staking, shrub and ground cover planting details.
- C. Planting Season:
  - 1. Plant only during the normal planting season and after major construction work has been completed unless otherwise approved by the Owner's Representative.
- D. Layout:
  - 1. Stake tree locations and layout other plant materials on-grade for review and approval by Owner's Representative prior to digging planting pits.
  - 2. Space ground cover plants in accordance with the triangular on-center dimensions indicated on the Plans.
  - 3. Adjust spacing of ground covers and shrubs as necessary to evenly fill planting bed with indicated quantity of plants.
  - 4. Layout groundcover plants and grasses at least 18 inches from new trees in planting beds. Layout shrubs within 12 inches from edge of walls and pavements.
  - 5. Plant grouping layout review: Where Plans indicate distinct plant groupings within contiguous planting bed areas, use stakes and string or other temporary materials to clearly outline and indicate boundaries within which each grouping will be planted, as indicated on Plans.
- E. Installation:
  - 1. Schedule Owner's Representative's review of planting layouts and obtain written approval before proceeding with planting.
  - 2. Install plants immediately after review and approval by Owner's Representative. If there are unavoidable delays, cover root balls with moist soil or mulch. Install plantings within plant grouping areas where applicable.
  - 3. Orient plants as shown on the Plans or by Owner's Representative for branching clearance and best appearance. Place trees first. Follow with major shrubs then groupings, then ground covers.
  - 4. Completely remove wire baskets, peat pots, containers, burlap wrappings and ties from root balls. Ensure root ball conforms to the minimum root ball dimensions.
  - 5. Trees:
    - a. Cut roots that circle or mat along the sides and bottom of the root ball. Remove up to 2 inches of excess soil over root flare and cut away superficial roots that grow over the root flare of the trees.
    - b. When trees are planted within 5 feet of pavement set root flare 2 inches above pavement elevation.
    - c. Hold tree firmly in position while backfill is placed to grade. Place backfill carefully, avoiding root damage and filling voids. When hole is approximately 2/3 full, compact backfill by watering to avoid air pockets. Install root ball completely in soil.
    - d. Stake trees per details shown on Plans.

6. Plants:
  - a. Cut roots that circle or mat along the sides and bottom of the root ball.
  - b. Set plants in center of pits, on prepared subgrade or amended soils. Plants to bear same relationship with finish grade after settlement as they bore natural grade.
7. Remove temporary layout materials including stakes and string after Substantial Completion.

### 3.5 MULCH:

- A. Provide 2-inch depth of mulch in new planting beds immediately after planting, including planting bed islands and tree wells in lawn areas. Rake mulch to provide a uniform finished surface.
- B. At proposed trees, mulch shall not be thicker than 4 inches deep and no mulch placed 3" from root crown.
- C. Mulch shall be tapered back to avoid burying small plants and placing on trunks of trees and shrubs.

### 3.6 TOP DRESS

- A. 30 days minimum to 45 days maximum following planting, top dress with approximately 1 inch of mulch within 12-inches of all planted pavement edges.

### 3.7 ESTABLISHMENT PROTECTION:

- A. Protect new plantings against harm from wind, unusual weather, foot traffic or other vandalism through Substantial Completion. Special planting techniques may be required by the Owner's Representative for unseasonal planting or prolonged periods of drought.
- B. Plant Protection Fencing (if used as New Planting Protection): Install plant protection fencing along edges of planting zones per plans in a manner that will prevent people and animals from easily entering protected areas. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation. Maintain access to fire hydrants, meters or other utilities/amenities, Install per details on the Plans.
  1. Take care not to damage existing plants or compact existing soil when installing fencing.

### 3.8 PRUNING

- A. Provide minor pruning of trees and shrubs only as directed by the Owner's Representative to remove broken or damaged limbs or stems and to achieve proper plant branching structure, form and vertical or horizontal clearances. Prune branches at the branch collar. No stubs nor flush cuts are permitted. Prune to provide clearance as required by agency.

### 3.9 CLEAN UP

- A. Perform daily cleaning of adjacent pavements and landscape areas during installation and upon completion of work.

- B. Remove from the site excess materials, plant containers and coverings, soil, litter, debris and equipment.

3.10 MAINTENANCE

- A. Provide operations and maintenance of plantings and turf areas from installation until 60 days after Substantial Completion by the Owner's Representative.

3.11 ACCEPTANCE OF COMPLETED LANDSCAPE WORK

- A. Upon request by the Contractor, the Owner's Representative will review the completed landscape work for review and conformance to the Plans. Provide written notification at least 10 working days before requested review date.
- B. Landscape areas will be accepted provided requirements, including maintenance, have been complied with and plant materials are alive and in a healthy, vigorous condition.

3.12 ONE-YEAR WARRANTY

- A. Warrant the Work of this Section for a period of 1 year from the date of Substantial Completion against defects of materials and workmanship (the Warranty Period).
- B. During the Warranty Period, make replacements of plant materials within 30 days of awareness of plant death or abnormal growing condition. Plants damaged by vandalism after Substantial Completion or resulting from damage by Owner's Representative's occupancy of the site will not require replacement, unless improper installation is a contributing factor in the damage, including improper staking, plant pit size or protection.
- C. Plant replacement during the Warranty Period will be limited to 1 replacement per plant unless repeated failure is due to improper soil preparation, plant installation or the failure of plants to meet the specifications of this Section.
- D. Replace plants not in normal healthy growing condition at end of the Warranty Period as determined by Owner's Representative. Replace with plants of identical species and size.
- E. Remove tree stakes.
- F. Year Warranty Review: Notify Owner's Representative 1 month prior to end of Warranty period of Warranty end date. A final review may be held if requested by the Owner's Representative in presence of Contractor and Owner's Representative at the end of the Warranty Period. The Owner's Representative will notify parties of the Warranty review a minimum of 14 days prior to the anticipated meeting date.

END OF SECTION

Section 32 94 50 – Landscape Stone

1.1 SUMMARY

A. Section includes the following applications of landscape stone:

1. Field-placed boulders
2. Stones and boulders with signs
3. Transfer boulders
4. Love Rocks (both seek and find and

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For stone varieties proposed for use on Project, include photographs with a reference scale showing the size of the stones.

B. Samples:

1. For each stone type indicated, include at least two samples in each set for each type of stone, exhibiting extremes of the full range of color and other visual characteristics expected in completed Work. Samples will establish the standard by which stone provided will be judged. White granite boulders from Marenakos Rock Center, Issaquah, WA or equal.
2. For Love Rock etching, include at least two samples. Etching to be outline of traditional heart shape, 1/4" deep and 1/2" wide minimum.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs those experienced with moving and placing large specimen stones.

B. Source Limitations for Stone: Obtain each variety of stone, from one quarry or supplier with resources to provide materials of consistent quality in appearance and physical properties.

C. Mockup: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Protect accepted mockups from the elements with weather-resistant membrane.

2. Approval of mockups is for color, texture, and blending of stone; relationship of mortar colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.
  - a. Approval of mockups is also for other material and construction qualities the Owner's Representative specifically approves in writing.
  - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner's Representative specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 BOULDERS

- A. Boulders shall be locally available smooth, rounded, fine grain, granitic stone. Submit photos of selected boulders tagged in the stone supply yard for review and approval by the Owner's Representative.

- End of Section -

## SECTION 33 10 00 – WATER

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Materials and installation of utility pipes for the domestic water service.

#### 1.2 REFERENCES

- A. City of Forest Grove Standard Plans and Design Guidelines, Current Edition.
- B. Washington County Road Design and Construction Standards, Current Edition.
- C. Oregon Department of Transportation, Oregon Standards Specifications for Construction, 2018, as referenced.

#### 1.3 DEFINITIONS

- A. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### PART 2 - PRODUCTS

#### 2.1 PIPE AND FITTINGS

- A. Pipe smaller than four inches in diameter shall be copper tubing Type K, ASTM B88, annealed. The tubing shall be coupled using flare-type compression fittings, conforming to the requirements of AWWA C800, minimum 150-psi working pressure.
- B. Pipe shall be marked with the National Sanitation Foundation (NSF) seal and in accordance with ASTM and AWWA marking requirements, which include, but are not limited to, the manufacturer's name and class of pipe. Pipe shall bear no evidence of interior or exterior extrusion marks. Pipe walls shall be uniform, smooth, and glossy

#### 2.2 SOIL MATERIALS

- A. See Earthmoving Section 31 20 00.

2.3 DETECTABLE WARNING TAPE

- A. See Earthmoving Section 31 20 00.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation and trenching operations
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

3.2 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations. See Earthmoving.

3.3 UTILITY TRENCH BEDDING

- A. Place bedding on subgrades free of mud, frost, snow, or ice.
- B. Verify trenches are ready to receive work and are excavated to the dimensions and elevations indicated on the Contract Documents.
- C. Beginning installation means acceptance of existing conditions.

3.4 WATER SERVICE INSTALLATION

- A. Provide a minimum of 20-inches of cover.
- B. Install conductive warning tape for the entire length of the water service. See Earthmoving.
- C. Connect to building water system, refer to mechanical and plumbing specifications.

3.5 UTILITY TRENCH BACKFILL

- A. See Earthmoving Section 31 20 00.

3.6 TESTING AND ACCEPTANCE

- A. Coordinate testing with the City of Forest Grove.
- B. Testing shall occur in the following order;
  1. Perform initial flush of service line.
  2. Pressure test.
  3. Perform disinfection
  4. Flush after disinfection
  5. Bacteria test.

3.7 CLEANING

- A. Leave premises clean and free of residue of the work of this Section.

- END OF SECTION -

SECTION 33 30 00 – SANITARY SEWER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Materials and installation of utility pipes for the conveyance of sanitary flows.

1.2 REFERENCES

- A. Clean Water Services Design and Construction Standards R&O 17-05, Current Edition for Storm and Sanitary infrastructure.
- B. Washington County Road Design and Construction Standards, Current Edition for all activities not governed by Clean Water Services or City of Forest Grove design standards.
- C. Oregon Department of Transportation, Oregon Standards Specifications for Construction, 2018, as referenced.

1.3 DEFINITIONS

- A. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Sanitary sewer pipe shall have flexible gasketed joints. Joints on all fittings shall be the same as the joints used on the pipe. Caps or plugs shall be furnished with each fitting, outlet or stub as required with the same type gasket and/or joint in pipe.
- B. Sanitary Sewer Pipe shall be Polyvinyl Chloride Pipe-PVC Type:
  1. ASTM 3034 SDR 35 or SDR 26
- C. Gaskets shall conform to the requirements of ASTM 477 and ASTM 3212.
- D. Fittings:
  1. Tee fittings shall be provided in the sewer main for side sewers. All fittings shall be of sufficient strength to withstand all handling and load stresses encountered. All fittings shall be of the same materials as the pipe. Fittings shall be free from cracks and shall

adhere tightly to each joining surface. All fittings shall be capped or plugged and gasketed with the same gasket material as the pipe joint, fitted with an approved mechanical stopper, or have an integrally cast knockout plug. The plug shall be able to withstand all test pressures without leaking.

2. PVC pipe fittings shall conform to the applicable portions of the specifications ASTM 3034, and shall be the same as the pipe joints.
3. Line Tap Fittings shall be:
  - a. Indexed PVC Tee Saddle – Manufactured in accordance with ASTM D-3034 with minimum cell classification of 12454B-C or 12356-C as defined in ASTM D-1784. Elastomeric seals meeting ASTM F-477 specifications and are located at both the lead and skirt ends of the saddle. Stainless steel bands meeting series 300 and are a full 9/16-inch wide. This saddle is allowed on PVC pipe. See CWS Standard Detail 540.
  - b. Inserta Tee shall meet the same standard as the Indexed PVC Tee Saddle. This saddle is allowed only on thick wall pipe material e.g., concrete, ductile iron, ribbed type plastic. See Standard Detail 530.

- E. Grout shall be Sika 212, Euco N-S, Five Star or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C-827 and CRD-C-621. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing.

## 2.2 SOIL MATERIALS

- A. See Earthmoving Section 31 20 00.

## 2.3 DETECTABLE WARNING TAPE

- A. See Earthmoving Section 31 20 00.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation and trenching operations
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

### 3.2 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations. See Earthmoving.

### 3.3 UTILITY TRENCH BEDDING

- A. Place bedding on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

### 3.4 PIPE PLACEMENT

- A. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow. After each section of pipe has been lowered into the prepared trench, the Contractor shall clean the end of the pipe to be joined, the inside of the joint, and the rubber ring (if required) immediately before joining the pipe and make assembly of the joint in accordance with the recommendations of the manufacturer of the pipe and joint. The Contractor shall provide all special tools and appliances required for the joint assembly. After the joint has been made, the pipe shall be checked for alignment and grade.
- B. When cutting or machining pipe is necessary, the Contractor shall use only tools and methods recommended by the pipe manufacturer and approved by the City.
- C. When joining different types of pipes, the Contractor shall use approved rigid fittings.
- D. The Contractor shall install pipe zone material uniformly on both sides of the pipe up to the spring-line of the pipe. Material shall be compacted to ensure proper support within the haunching area.

### 3.5 LINE TAPS

- A. Line taps shall be core drilled unless approved otherwise by the City. Core drilled holds shall be done using a cylinder style hole saw for plastic pipe material or a diamond core bit for concrete and ductile iron pipes.
- B. Prior to installation of the tee, the area around the cored hole shall be clean and free of rough edges.
- C. While installing the tee, no rock, dirt or debris shall be allowed to enter the sewer mainline.
- D. The Contractor shall install ¾-inch minus gravel in the pipe zone around the line tape, from 4-inches below the pipe or to the undisturbed ground and to 6-inches above the pipe.

- E. Magnetic tape shall be installed within 18-inches of the top of the side sewer for the full length of the service.
- F. The sewer main shall be a minimum of two sizes (nominal inside diameter) larger than the line tap.
- G. A minimum wall thickness of 0.35 inches shall be required when installing an Inserta-tee.

### 3.6 UTILITY TRENCH BACKFILL

- A. See Earthmoving Section 31 20 00.

### 3.7 TESTING AND ACCEPTANCE

#### A. General

##### 1. Sequence of Testing

- a. Testing shall occur in the following order. At the City's discretion, failure of any of the tests may require that all testing be completed again.
  - 1) Compaction
  - 2) Placement of base rock or bedding
  - 3) Mandrel
  - 4) Air test
  - 5) Video

- 2. Test Type: All gravity sanitary pipelines shall pass the required air tests, pass the required compaction test in accordance with CWS Design Standards Chapter 7, Section 7.02.3(b)(6), be video inspected, and be free of visible leaks. All flexible pipes shall pass a deflection test.

- 3. The Contractor shall furnish all necessary testing equipment and perform the tests in a manner satisfactory to the City. Any arrangement of testing equipment, which will provide observable and accurate measurements of air leakage under the specified conditions, will be permitted. Gauges for air testing shall be calibrated with a standardized test gauge.

- B. Line Cleaning: Prior to the internal pressure testing for sanitary systems and inspections of sanitary and storm systems by the City, the Contractor shall ball and flush and clean all parts of the system. The Contractor shall remove all accumulated construction debris, rocks, gravel, sand, silt and other foreign material from the system at or near the closest downstream manhole. If necessary, the Contractor shall use mechanical rodding or bucketing equipment. Upon City inspection of the system, any foreign matter still present shall be flushed and cleaned from the system as required.

#### C. Air Testing, Pipe Line

##### 1. General

- a. After construction of the system, including service connections, required backfilling, compaction testing, placement of base rock for streets, and other required testing, the Contractor shall conduct a low-pressure air test. The Contractor shall provide all equipment and personnel for the test. The method, equipment, and personnel shall be subject to the approval of the District and City. The District or City may, at any time, require a calibration check of the instrument used. The pressure gauge used shall have minimum divisions of 0.10 psi and have an accuracy of 0.0625-psi (one-ounce per square inch). All air used shall pass through a single control panel.
2. Safety Precautions
    - a. All plugs used to close the sewer for the air test must be capable of resisting the internal pressures and must be securely braced, if necessary. All air testing equipment must be placed above ground and no one shall be permitted to enter a manhole or trench where a plugged line is under pressure. All pressure must be released before the plugs are removed. The testing equipment used must include a pressure relief device designed to relieve pressure in the test line at 10 psi or less and must allow continuous monitoring of the test pressures in order to avoid excessive pressure. The Contractor shall use care to avoid the flooding of the air inlet by infiltrated ground water. The Contractor shall inject the air at the upper plug if possible. Only qualified personnel shall be permitted to conduct the test
3. Method: All air testing shall be by the Time Pressure Drop Method. The test procedures are described as follows:
    - a. Clean the lines to be tested and remove all debris.
    - b. The Contractor has the option of wetting the lines prior to testing.
    - c. Plug all open ends with suitable test plugs; brace each plug securely.
    - d. Check the average height of ground water over the line. The test pressures required below (Section 8.05.4(c)(8)) shall be increased 0.433 psi for each foot of average water depth over the line.
    - e. Add air slowly to the section of system being tested until the internal air pressure is raised to the test pressure specified below (Section 8.05.4(c)(8)).
    - f. After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize, adding only the amount of air required to maintain pressure.
    - g. After the temperature stabilization period, disconnect the air supply.
    - h. Acceptance shall be based upon meeting or exceeding the requirements specified below.

- 1) The minimum time duration permitted for the prescribed low-pressure exfiltration pressure drop from a starting pressure of 4.0 psi between two consecutive manholes should not be less than that shown in Tables 8-4 or 8-5. The tables list test duration values for pressure drops of 1.0 psi and 0.5 psi in excess of ground water pressure above the top of the sewer pipe, respectively. Values given accommodate both an allowable average loss per unit of surface area and an allowable maximum total leakage rate.
  - 2) Record the diameter (in), length (ft), end manhole number, time, pressure drop, and groundwater level of the test on an inspection form. The recording form shall become a permanent record of the project.
4. Deflection Test for Flexible Pipe
- a. Sewers constructed of flexible pipe materials shall be deflection-tested. The test shall be conducted by pulling an approved mandrel through the completed pipeline. The diameter of the mandrel shall be 95 percent of the nominal pipe diameter unless otherwise specified by the District. The mandrel shall be a rigid, nonadjustable, odd-numbering-leg (9 legs minimum) mandrel having an effective length of not less than its nominal diameter. Testing shall be conducted after placement of base rock for streets and after the line has been completely balled and flushed out with water, compaction tests have been completed and accepted.
  - b. The Contractor will be required to locate and repair any sections failing to pass the deflection test and to retest the section.
5. Video Inspection of Gravity Systems
- a. All sewers shall be video inspected and recorded in accordance with the order prescribed in Section 8.05.1 prior to the District or City acceptance of the systems. All pipes shall be thoroughly flushed immediately prior to the video inspection. A 1- inch target ball shall be placed in front of the camera. If the system is video inspected by a private firm or entity other than the District or City, a copy of the video recording and a written TV Inspection Report on a form approved by District, shall be supplied to the District or City. The video recording shall be recorded in color and on an electronic format as approved by the District. All problems discovered during video inspection shall be noted on the video recording and the written report.
6. Video Inspection for Warranty Acceptance
- a. The sewer lines shall be video inspected during the one-year warranty period to determine any defects in the system that are to be corrected by the developer or Contractor.

- END OF SECTION -

## SECTION 33 40 00 – STORM DRAINAGE SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Materials and installation of utility pipes for the conveyance of stormwater flows.

#### 1.2 REFERENCES

- A. Clean Water Services Design and Construction Standards R&O 17-05, Current Edition for Storm and Sanitary infrastructure.
- B. Washington County Road Design and Construction Standards, Current Edition for all activities not governed by Clean Water Services or City of Forest Grove design standards.
- C. Oregon Department of Transportation, Oregon Standards Specifications for Construction, 2018, as referenced.

#### 1.3 DEFINITIONS

- A. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### PART 2 - PRODUCTS

#### 2.1 CATCH BASINS AND INLETS

##### A. Aggregate and Portland Cement

1. Per CVWD Technical Specifications for Conveyance Systems, Chapter 8.

##### B. Frames, Grates and Covers

1. Per CVWD Technical Specifications for Conveyance Systems, Chapter 8.

##### C. Precast Concrete Units

1. Per CVWD Technical Specifications for Conveyance Systems, Chapter 8.

#### 2.2 PIPE AND FITTINGS

- A. Solid Wall PVC Pipe and fittings

1. Per CVWD Technical Specifications for Conveyance Systems, Chapter 8.
- B. Slotted Storm Drain Pipe (SSD) and fittings
1. SSD shall be perforated polyvinyl chloride sub-surface drain (SSD) pipe and fittings conforming to ASTM D2241 SDR 21 (Class 200) or ASTM D1785 Schedule 40. ASTM 2241 pipe shall have rubber gasket joints, and ASTM D1785 pipe shall have solvent welded joints. The slotted perforations shall be 0.0064" wide x1.00"long and spaced 0.3 inch apart on center. The slotted perforations on the pipe shall be oriented as specified in the drawings.
- C. Fittings
1. Per CVWD Technical Specifications for Conveyance Systems, Chapter 8.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation and trenching operations
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

#### 3.2 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations. See Earthmoving.

#### 3.3 UTILITY TRENCH BEDDING

- A. Place bedding on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

### 3.4 PIPE PLACEMENT

- A. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow. After each section of pipe has been lowered into the prepared trench, the Contractor shall clean the end of the pipe to be joined, the inside of the joint, and the rubber ring (if required) immediately before joining the pipe and make assembly of the joint in accordance with the recommendations of the manufacturer of the pipe and joint. The Contractor shall provide all special tools and appliances required for the joint assembly. After the joint has been made, the pipe shall be checked for alignment and grade.
- B. When cutting or machining pipe is necessary, the Contractor shall use only tools and methods recommended by the pipe manufacturer and approved by the Owner's Representative.
- C. When joining different types of pipes, the Contractor shall use approved rigid fittings.
- D. The Contractor shall install pipe zone material uniformly on both sides of the pipe up to the spring-line of the pipe. Material shall be compacted to ensure proper support within the haunching area.

### 3.5 UTILITY TRENCH BACKFILL

- A. See Earthmoving Section 31 20 00.

### 3.6 TESTING AND ACCEPTANCE

- A. General
  - 1. Sequence of Testing
    - a. Testing shall occur in the following order. At the Owner's Representative's discretion, failure of any of the tests may require that all testing be completed again.
      - 1) Compaction
      - 2) Placement of base rock or bedding
      - 3) Mandrel
      - 4) Air test
      - 5) Video
  - 2. Test Type: All gravity storm systems shall be video inspected, pass the required compaction test in accordance with CVWD Standards Section 7-02.3(b), and a deflection test for flexible pipes. All details of testing procedures shall be subject to approval by the City of Forest Grove.
  - 3. Testing Equipment
    - a. The Contractor shall furnish all necessary testing equipment and perform tests in a manner satisfactory to the City of Forest Grove.
- B. Line Cleaning: Prior to the internal pressure testing for sanitary systems and inspections of sanitary and storm systems by the City, the Contractor shall ball and flush and clean all parts of

the system. The Contractor shall remove all accumulated construction debris, rocks, gravel, sand, silt and other foreign material from the system at or near the closest downstream manhole. If necessary, the Contractor shall use mechanical rodding or bucketing equipment. Upon City inspection of the system, any foreign matter still present shall be flushed and cleaned from the system as required.

- END OF SECTION -