



Public Works Standards & Specifications

DIVISION II - STREETS AND RELATED WORK

201 MOBILIZATION

201.1.00 DESCRIPTION

This work consists of operations necessary to move personnel, equipment, supplies, and incidentals to the project site, set up all field offices and facilities, and other preparatory work necessary in preparation to perform contract work.

201.4.00 MEASUREMENT AND PAYMENT

201.4.01 LUMP SUM BASIS

When listed in the proposal as a pay item, payment for mobilization will be the Contract lump sum amount. There will be no measurement of work performed under this section.

The amounts paid for mobilization in the progress payment(s) will be based on the percentage of the original Contract amount that is earned from other contract items, not including advances on materials, and as follows:

- 1) When 15% is earned from other bid items, 50% of the amount for mobilization or 15% of the original contract amount, whichever is the least, less normal retainage, will be paid.
 - 2) When 50% is earned from other bid items, 100% of the amount for mobilization or 50% of the total original contract amount, whichever is the least, less normal retainage, will be paid.
 - 3) Upon completion of all work on the project, payment of any amount for mobilization in excess of 50% of the total original contract amount will be paid.
- a. The above schedule of payments for mobilization shall not be construed to limit or preclude progress payments otherwise provided for in the contract.

201.4.02 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, mobilization shall be considered incidental work for which no separate payment will be made.

202 TEMPORARY TRAFFIC CONTROL

202.1.00 DESCRIPTION

This work consists of maintaining facilities to accommodate public traffic through and within the project site as necessary to conduct construction operations so as to offer the least possible obstruction and inconvenience to the public, and to protect pedestrian and vehicular traffic. Where applicable, Section 00220 of the *Oregon Standard Specifications for Construction* and the *Manual of Uniform Traffic Control Devices* shall apply. The work shall include, but is not limited to the following, hereafter referred to as Traffic Control Devices:

- A. Semi-permanent Traffic Control Devices are defined as devices maintained at one location during the life of the contract or until replaced by other signs.
- B. Temporary Traffic Control Devices are such devices as certain warning signs and traffic cones which may be moved frequently.
- C. Flaggers include personnel, pilot cars and associated warning signs.

202.1.01 TRAFFIC CONTROL PLAN

At the pre-construction conference, the Contractor may be required to submit to the City Engineer for approval a Traffic Control Plan and Schedule for the type and placement of all Traffic Control Devices and other Temporary Traffic Control. The Contractor's plan shall include such items as the spacing and size of Traffic Control Devices, the legends of warning signs, the methods of supporting Traffic Control Devices, the number of flaggers required, and periods of operation requiring flaggers.

During the performance of the work, the Contractor shall notify the Engineer, and obtain approval from the Engineer, for any revision or modification of this plan.

All Traffic Control Devices shall remain the property of the Contractor.

202.1.02 FAILURE TO MAINTAIN TRAFFIC CONTROL DEVICES

Failure to maintain Traffic Control Devices in accordance with the plans and specifications shall result in the immediate suspension of work. During suspension of the work for failure to maintain Traffic Control Devices, workdays will continue to be charged to the Contract. The following representatives of the City of Sisters shall have the authority to suspend work for failure to maintain Traffic Control Devices:

- City Engineer or authorized representatives
- Public Works Director or designee
- Uniformed officers of the Deschutes County Sheriff's Department

During suspension of work, for any reason, the Contractor shall continue to be responsible for and shall maintain temporary Traffic Control.

202.2.00 MATERIALS

Flaggers, procedures, barricades, signs, and other Traffic Control Devices shall conform to the latest edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways*, published by the U.S. Department of Transportation Federal Highway Administration, and the Oregon Sign Policy and Guidelines for the State Highway System, published by the Oregon Department of Transportation.

202.3.00 CONSTRUCTION

Semi-permanent Traffic Control Signs shall be mounted on single or double posts such that the bottom of the sign is 7' above the ground. All other signs may be mounted on acceptable portable and temporary bases.

All devices shall be maintained by the Contractor in proper position, clean, and legible at all times. Lights, flashers, and similar devices shall be kept clean, visible, and operable. Devices damaged or destroyed by any means shall be immediately repaired, restored, or replaced by the Contractor. On a daily basis, and prior to beginning and ceasing operation, the Contractor shall patrol the traffic control area for the purpose of maintaining devices and removing or covering all non-applicable signs during periods not needed. Unless otherwise specified in these documents, public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. The Contractor shall provide access to private properties at all times except during brief, urgent stages of construction.

The Contractor shall delineate all business accesses with blue tubular markers on 10 foot maximum spacing. Mark the access with Type "B" "BUSINESS ACCESS" signs. Locate and install these signs on Type 2 barricades as directed. Business owner(s) shall be given 72 hours notification in advance of operations requiring temporary closures of business access, when necessary and when no other access to the business can be provided.

The Contractor shall give occupants of property fronting a street at least 48 hours' notice before more

than half the street is closed to vehicular traffic due to his operations. The Contractor shall not close a street without prior knowledge of the Engineer and permission of the City of Sisters. The Contractor is responsible for coordinating the closing of a street with all concerned and affected individuals and public agencies. Notify, in writing, the Engineer, all affected emergency services, school district, and U.S. Postal Service a minimum of seven (7) calendar days prior to any road closure.

For pipe installation in major City streets and intersections, backfill and pave the excavation at the end of each shift, or use other methods as approved by the Engineer to provide a traversable surface across the entire roadway width during non-working hours. If this requirement is not met, provide additional traffic control measures, including flagging, as required by the Engineer at no additional cost to the City.

202.4.00 MEASUREMENT AND PAYMENT

202.4.01 LUMP SUM BASIS

When listed in the proposal as a separate pay item, measurement and payment for Temporary Traffic Control will be made on Lump Sum basis. Payment will be pro-rated based on workdays charged over the contract time. Upon completion of the contract any remaining portion of the lump sum amount will be paid.

202.4.02 INCIDENTAL BASIS

When neither specified nor listed in the Proposal as a separate pay item, Temporary Traffic Control will be considered incidental work for which no separate payment will be made.

202.4.03 PER ITEM BASIS

When listed in the proposal as a separate pay item, Semi-permanent Traffic Control Signs shall be measured by the square foot of sign area. Payment will be only for those signs approved by the Engineer and called for in the Traffic Control Plan and Schedule. Payment shall be full compensation for constructing, providing and maintaining the traffic control signs for the life of the contract. Where flashers, lights or the equivalent are specified, any cost for such items shall be incidental to the price bid. Payment will be at the contract unit price bid for Semi-permanent Traffic Control Signs.

When listed in the proposal as a separate pay item, semi-permanent Traffic Control Barriers shall be measured by the lineal foot of barrier face. Payment will be only for those barriers approved by the Engineer and called for in the Traffic Control Plan and Schedule. Payment shall be full compensation for constructing, providing, and maintaining the Traffic Control Barriers for the duration of contract work requiring barriers. Where flashers, lights, or the equivalent are specified, any cost for such items shall be incidental to the price bid. Payment will be at the contract unit price bid for Traffic Control Barriers.

When listed in the proposal as a separate pay item, Flaggers shall be measured by the actual hours each Flagger is required to work. Hours will be measured to the nearest whole hour. All associated safety equipment, signs, tools and materials shall be incidental to the price bid. Payment will be only for Flaggers approved by the Engineer and called for on the Traffic Control Plan and Schedule. Payment shall be at the contract unit price bid for Flaggers.

203 CLEARING AND GRUBBING

203.1.00 DESCRIPTION

Except as modified or supplemented herein the provisions of Section 00320 of the *current edition Oregon Standard Specifications for Construction* shall apply.

CLEARING AND GRUBBING shall include, but not be limited to, the removal and disposal of all concrete including curbs, sidewalks and walls; all vegetative growth such as trees, snags, down timber, vines, shrubs, brush, stumps; fences, guard rails, irrigation pipe and street structures, pavement, debris and rubbish of any nature; and other similar items not specifically covered by unit price. All debris shall be broken up and removed from the site. The work also includes preserving vegetation and objects designated to remain in place and cleanup of the work area.

203.3.00 CONSTRUCTION

Trees, shrubbery and flowerbeds designated on the plans or directed by the Engineer to remain shall be left in place and care shall be taken by the Contractor not to damage or injure such trees, shrubbery or flowerbeds by any of Contractor's operations.

Where trees exist in parking areas and are not to be removed, it shall be the Contractor's responsibility to trim low limbs which will interfere with the normal operation of Contractor's equipment. The trimming shall be performed in a professional manner by competent personnel prior to Contractor's machine operations and in such a manner as the Engineer or designee may direct.

The Contractor shall be responsible for all damages to existing improvements resulting from his construction operations or acts by his employees.

203.3.01 DISPOSAL

All matter and debris accumulated from clearing and grubbing operations become the Contractor's property. The Contractor shall make arrangements for disposal of this material in accordance with local laws and regulations. All expenses for disposal of waste materials shall be the responsibility of the Contractor.

203.3.02 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures shall be installed in accordance with Appendix 9B of the Central Oregon Stormwater Manual to ensure that sediment laden runoff does not leave areas disturbed by construction.

203.4.00 MEASUREMENT AND PAYMENT

CLEARING AND GRUBBING will not be measured. Removal and disposal of all trees not specifically covered under TREE REMOVAL item shall be considered incidental to CLEARING AND GRUBBING. Payment will be at the contract lump sum amount bid for CLEARING AND GRUBBING. Payment shall include full compensation for all labor, equipment, tools and incidentals necessary to complete the work and dispose of all waste materials.

204 EARTHWORK

204.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00330 of the *current edition APWA Oregon Standard Specifications for Construction* shall apply.

This work consists of excavation and grading the roadway, side streets, sidewalk and planting areas, alleys, cuts, embankments, slopes, roadway ditches, side streets, driveway and alley approaches and all other earth moving work required in the construction of the project including disposal of all surplus material. The term "earthwork" will be used as a general term to designate the work included within the scope of this section.

204.1.02 UNCLASSIFIED EXCAVATION

Unclassified excavation is defined as all excavation regardless of the type, nature, or condition of the

materials encountered. The Contractor shall assume full responsibility to estimate the kind and extent of the various materials to be encountered in the work.

204.2.00 MATERIALS

Excavated materials may be used on the project unless declared unsuitable or surplus by the Engineer. It is the responsibility of the Contractor to separate unsuitable material from the excavated material, and to make arrangements for disposal of surplus material.

204.2.01 BORROW AND EMBANKMENT MATERIAL

Fills and embankments shall be constructed with material from the excavations or borrow material, subject to approval by the Engineer. Should additional fill material be needed, the Contractor shall supply borrow material in accordance with specifications acceptable to the Engineer.

204.3.00 CONSTRUCTION

204.3.01 PRESERVATION OF EXISTING IMPROVEMENTS

Asphalt pavement saw cuts shall be straight lines, having vertical faces and are required wherever existing pavement is to be matched or removed to a line designated on the plans and as directed by the Engineer.

204.3.02 EXCAVATION OF EXISTING IMPROVEMENTS AND MISCELLANEOUS

Removal of existing roadbeds and driveways are included in the general excavation quantities. The Contractor will be responsible for the excavation of areas to be patched with asphalt concrete.

The Contractor shall place base material in all areas designated for asphalt patching as shown on the drawings. Base material shall be provided by the Contractor where a separate contract for paving work exists. No separate payment will be made for this work, but shall be considered incidental to General Excavation.

Base material shall be provided by the Contractor designated to provide base material, such that immediately upon approval by the Engineer, traffic ramps of base material shall be placed at such locations as Driveway AC Patch, ends of existing cut pavement, and other areas as directed by the Engineer. Placing of base material ramps shall not be measured or paid for separately, but shall be considered incidental to GENERAL EXCAVATION.

204.3.03 PREPARATION OF EMBANKMENT FOUNDATION

The area to be filled shall first be cleared and grubbed. The Contractor shall break up and roughen the ground surface before embankment material is placed. Areas designated as Obliterate Roadway shall be broken up so no fragment has a dimension greater than 6". The loosened and broken fragments shall be mixed and blended such that no seams shall form in the compacted fill. The Contractor shall compact the natural ground underlying embankments to the depth of the grubbing, or a minimum of 12", to the relative density specified for the embankment material to be placed.

204.3.04 EMBANKMENT CONSTRUCTION

A. Earth Embankment Construction

Earth embankments shall be defined as those embankments constructed of materials less than 6 inches in greatest dimension. The material shall be placed in lifts as directed by the Engineer not to exceed 3 feet in depth. Within 3 feet of subgrade or finished slope, the placement of fill shall be in lifts not to exceed 8 inches. Each lift shall be compacted by tamping, sheepsfoot rollers, pneumatic tire rollers, or other mechanical means approved by the Engineer, to produce the specified relative compaction. At locations where it would be impractical to use such compacting equipment, fill layers shall be compacted to the specified requirements by hand directed compaction equipment.

Unless otherwise specified, each lift shall be compacted to a relative density of 95% of maximum as determined by AASHTO T-99 Method A.

When soil types or a combination of soil types are encountered that develop densely packed surfaces as a result of spreading or compaction operations, the surface of each lift shall be sufficiently roughened after compaction to insure bonding to the next succeeding layer.

B. Rock Embankment Construction

Rock embankments shall be defined as those embankments constructed of material containing particles greater than 6 inches in greatest dimension.

No rock embankments shall be constructed of material larger than 3 feet in greatest dimension. The material shall be placed in lifts as directed by the Engineer not to exceed 3 feet in depth. Within 3 feet of subgrade or finished slope, the placement of fill shall be in lifts not to exceed 8 inches with any rock fragments having a dimension greater than 8 inches. The rock shall be distributed and manipulated in such a manner that the interstice space between the larger pieces shall be filled with smaller pieces, forming a dense homogeneous and compact mass. All materials shall be maintained at the optimum moisture content during all phases of the embankment operation.

After each lift of material is placed and spread in such a manner to completely fill all interstices with material no greater than 1/4" in greatest dimensions, said lifts shall be compacted with sufficient compaction effort to achieve the required density. Compaction effort shall at a minimum equal or exceed the following levels:

Each 6-inch depth of lift or fraction thereof shall be compacted with at least one full pass with a vibratory roller having a minimum dynamic force of 40,000 pounds impact per vibration and a minimum frequency of 1,000 vibrations per minute, providing this produces the specified density of material.

If the nature of the material and the Contractor's operation demonstrates that a lift thickness of 1.50 feet is not exceeded and complies with all applicable specifications, then each lift shall be compacted with 4 full passes per 6 inch depth, or portion thereof, of lift with an approved vibratory roller with a dynamic force of not less than 30,000 pounds impact per vibration and a minimum frequency of 1,000 vibrations per minute, providing this produces the specified density.

Rollers shall be so constructed that they exert uniform pressure over the area covered. Vibratory rollers shall be operated at speeds not to exceed 1.5 miles per hour. In addition to the above rolling, each lift shall be further compacted by routing loaded and unloaded hauling equipment uniformly over the entire length and width of the embankment.

Unless otherwise specified, each lift shall be compacted to a uniform density of 95% of maximum as determined by AASHTO T-99 Method A.

204.3.05 COMPACTION AND DENSITY REQUIREMENTS

Fill shall be compacted to not less than 95 percent maximum density as determined by AASHTO T-191, or an equivalent method approved by the Engineer. Compaction testing shall be performed in conformance with Division I, Section 101.3.05

204.3.06 FINISHING

Areas, where "grade only" is called for on the plans, shall be graded to meet the tolerances for the subgrade where base material is to be placed. The surface shall be constructed to a straight grade from the finished improvement elevations shown on the plans to the elevations of the existing ground at the extremities of the area to be graded. Driveways shall be constructed to a straight grade from the finished improvement elevations to the elevation of the existing driveway for the width of the driveway as shown on the plans. The area shown on the plans for "grade only driveway" does not include cut and fill slopes. Such slopes shall conform to the specifications given with the typical section for the station of the driveway. Grade only shall not be paid for separately but shall be considered incidental to GENERAL EXCAVATION.

204.4.00 MEASUREMENT AND PAYMENT

204.4.01 UNCLASSIFIED AND CLASSIFIED EXCAVATION

Unless otherwise indicated in the Contract Documents, all excavation shall be considered unclassified. GENERAL EXCAVATION has been computed from cross sections and the excavation will not be re-measured unless there are plan changes that are directed or approved by the Engineer. The estimated quantity on the Schedule of Bid Items will be the measured quantity for payment. In the event of plan changes, the estimated quantity will be adjusted to reflect the change. Changes in general excavation will be measured by the cubic yard and payment will be made at the contract unit price bid for GENERAL EXCAVATION.

The unit price bid per cubic yard shall include full compensation for all labor, equipment and materials required to excavate the roadway to the lines and grades shown on the plans.

Asphalt pavement cuts will not be measured or paid for separately, unless specified on the plans and listed in the Schedule of Bid Items. If not listed separately, Asphalt pavement cuts will be considered incidental work to GENERAL EXCAVATION.

204.4.02 EMBANKMENT

The pay quantities of "Embankment in Place" will be limited to the neat lines of specified cross sections, lines, grades and slopes and above the ground or base elevations existing at the time embankment construction thereon begins. The pay quantities will not include additional quantities required caused by subsidence or settlement of the ground or foundations, to settlement of materials within the embankments, or to shrinkage, washout, slippage or loss of material regardless of cause. If at any time during construction the contractor feels that this is not an accurate representation of actual embankment constructed, he/she shall notify the City immediately of the possible discrepancy. The Contractor shall be responsible for collection of data necessary to determine the actual amount of construction embankment. The cost of data collection will be considered incidental to payment for unit prices, and no separate payment will be made. Cross-Sectional information used in the design of the project will be made available by the City.

205 WATERING

205.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00340 of the *current edition Oregon Standard Specifications for Construction*, shall apply.

This work consists of furnishing and applying water, or combinations of water and additives for compacting and preparing excavations, embankments, backfills, subgrades, subbases, surfacing or for dust control, clean-up, or other purposes as determined by the Engineer. Excluded from this section is water used in Portland cement concrete construction and water used for testing purposes.

205.2.00 MATERIAL

205.2.01 WATER

Water used in the work shall be free of silts and hazardous or deleterious substances. The Contractor shall maintain an adequate supply of water at the job to conduct operations in a timely manner.

The City may provide water for a fee to the Contractor from a fire hydrant or similar source. The Contractor must make application to the City Public Works Department for such service prior to using any City water. Only City furnished and approved metering devices connected to designated fire hydrants may be used to obtain water from the City water distribution system. An approved air gap for backflow prevention shall be provided prior to filling any water trucks or tanks.

205.3.00 CONSTRUCTION

The Contractor shall apply water by means which result in uniform and controlled application.

If the Contractor has not provided water as ordered by the Engineer, the Owner may provide water and charge any applicable costs to the Contractor.

205.4.00 MEASUREMENT AND PAYMENT

205.4.01 UNIT PRICE BASIS

When listed in the proposal as a separate pay item, measurement and payment for Watering will be made on a unit price basis. The Contractor shall be responsible for maintaining an accurate record of the amount of water approved or ordered by the Engineer and applied to the project; and for submitting these records with progress payment requests for payment on a monthly basis. Water will be measured by the number of thousands of gallons actually used according to the records maintained by the Contractor on City authorized forms and as verified by the Engineer.

Payment for water will be at the contract unit price bid for each 1,000 gallons (Kgal) of water, as measured to the nearest 1,000-gal increment.

205.4.02 INCIDENTAL BASIS

When neither specified nor listed in the Proposal as a separate pay item, watering will be considered incidental work for which no separate payment will be made.

206 SUBGRADE

206.1.00 DESCRIPTION

This work consists of excavating and disposing of unstable materials, and placing subgrade geotextiles, rock embankment and/or aggregate backfill necessary for the preparation of the subgrade. Subgrade is defined as the surface area upon which additional materials are to be placed as part of the work covered by this contract, or by future work.

206.3.00 CONSTRUCTION

206.3.01 PREPARATION

Prior to starting subgrade work, all underground work and installation of utilities in the area of the subgrade shall be completed.

The Contractor shall blade, shape, and compact the subgrade to lines and grades as shown or directed, removing all irregularities and securing a uniform surface. The Contractor shall remove all unsuitable material as directed and replace with suitable material at no extra cost to the owner.

After the placement of curbs and drainage structures, the Contractor shall fine blade the subgrade surface to the specified tolerances.

206.3.02 TOLERANCES

Subgrade shall not vary by more than 0.05 foot from the specified grades and cross section, except that, at the discretion of the Engineer, the specified grades and cross section at centerline may vary 0.1 foot, provided that the variance is at least 75 feet from a manhole or fixed feature, does not affect drainage, and a uniform and regular cross section is maintained. Variations within the above specified tolerances shall be compensating so that the average grade and cross section shall meet these specifications.

206.3.03 GEOTEXTILE STABILIZATION

Geotextile fabric installation for embankment reinforcement or subgrade/subbase stabilization will be as directed by the Engineer in locations where unsuitable materials are found below subgrade. Geotextile installation shall be in conformance with Section 00350 of the *APWA Oregon Standard Specifications for Construction, latest edition*.

206.4.00 MEASUREMENT AND PAYMENT

No measurement or separate payments will be made for work required for the preparation of subgrade. This work is incidental to the price bid for EXCAVATION.

Furnishing and installation of Geotextile fabric, where directed by the Engineer, will be paid for on a square unit measurement basis. Payment will be full compensation for all equipment, labor, and incidentals necessary to complete the work. No separate payment will be made for constructing laps, seams, joints, and patches unless the Engineer orders additional amounts over the minimum.

207 AGGREGATE BASES

207.1.00 DESCRIPTION

This work consists of furnishing and placing, spreading, compacting, and fine grading aggregate base material for streets, driveways, sidewalks, pathways, and other structures. All work shall be in accordance with Section 00641 of the current *Oregon Standard Specifications for Construction*, and as supplemented or modified hereafter.

207.2.00 MATERIALS

Base aggregates shall consist of crushed gravel or crushed rock, including sand, free of frozen material, with less than the percentage listed below by weight of deleterious material, to include humus, organic matter, vegetable matter, clods, sticks, and debris.

207.2.01 FRACTURE OF GRAVEL

Gravel shall have at least one fractured face on 50 percent of the material retained on each sieve size 1 1/2 inch and above and 70 percent for the material passing the 1 1/2-inch sieve and retained on each of the sieves down to 1/4 inch.

207.2.02 DURABILITY

The source material from which aggregate base materials are obtained, produced or manufactured, shall meet the following qualifying test requirements.

Test	Test Method	Requirements
Degradation (Coarse Aggregate):		
Passing No. 20 sieve	ODOT TM 208	30 percent maximum
Sediment Height	ODOT TM 208	3 inch maximum
Abrasion:	AASHTO T 96	35 percent maximum

207.2.03 SAND EQUIVALENT

Base aggregates to be incorporated in the work shall have a sand equivalent of not less than 30 when tested in conformance with AASHTO T 176.

207.2.04 DELETERIOUS MATERIALS

207.2.04A Wood Waste

Allowable limits of wood waste, as determined by weight by test method OSHD TM 225, follow:

- (1) Arterial - 0.1 percent
- (2) Collector – 0.1 percent
- (3) Local Street & Cul-de-sac - 0.35 percent
- (4) All Weather Surface Road - 0.35 percent
- (5) Alley - 0.35 percent

Oversize pieces, which are retained on the top sieve size, are limited to 25 percent of the total amount of wood waste allowed.

207.2.04B Metal Waste

Allowable limit of metal waste, as determined by weight, is 0.1 percent.

207.2.05 GRADING REQUIREMENTS

Base aggregates shall conform to the following grading requirements.

Separated Sizes:	2½"-0	2"-0	1½"-0	1"-0	¾"-0
<u>Sieve Size</u>	% Passing (by weight)				
3"	100				
2 1/2"	95-100	100			
2"		95 - 100	100		
1 1/2"			95 - 100	100	
1 1/4"	55 -75				
1"		55 - 75		90 - 100	100
¾"			55-75		90 - 100
1/2"				55 -75	
3/8"					55 - 75
1/4"	30 - 45	30 - 45	35 - 50	40 - 55	40 - 60
No. 10	12 -27	12 - 27	14 - 30	16 -33	16 - 36

No. 40	0 - 16	0 - 16	3 - 18	8 - 24	8 - 24
No. 200	0 - 9	0 - 9	0 - 8	0 - 8	0 - 10

Sieve analysis will be determined according to AASTO T 27.

BASE AGGREGATE GRADATION FOR LOCAL STREETS

SIEVE SIZE	1"-0 BASE	3/4"-0 BASE
	% PASSING	% PASSING
1 1/2	100	-
1	90-100	100
3/4 -0	-	90-100
1/2 -0	50-80	-
3/8 -0	-	50-80
*1/4-0	35-50	40-60

Recommendation for base: 1"-0 or 3/4"-0.

* Of amount passing 1/4" sieve, 40-60% shall pass the No.10 sieve.

207.2.06 DRY UNIT WEIGHT

Base aggregates for use on arterials and collector streets shall have a dry unit weight of not less than 100 lbs./C.F. as determined per AASHTO T19.

207.2.07 ACCEPTANCE

Aggregate base will be sampled for acceptance in the following priority order:

- (a) Immediately after crushing as long as produced and placed within one year of placement.
 - (b) In the stockpile after all shaping work has been completed; or, one test per project or 1 test every 5,000 cubic yards.
 - (c) In its final state on the roadbed after all processing and prior to the placement of subsequent surfacing materials; See Section 108.2.00 General Conditions, for testing procedures. Frequency: One test per job or one test per 1,000 cubic yards.
- *Jobs 500 Cu. Yd or less may use letter of certification or an approved testing lab as proof of acceptable aggregate base.

207.3.00 CONSTRUCTION

207.3.01 STOCKPILING

The materials to be furnished in stockpiles shall be of the kinds, sizes and quality specified. Each designated size of material shall be placed in a separate stockpile.

Stockpiles shall be at least 8 feet high with side slopes of 1 1/2 horizontal to 1 vertical. The method used in placing the material in the stockpile shall be such as to minimize segregation of the aggregate particles.

207.3.02 MIXING

The materials shall be mixed until well blended. The contractor shall add water during mixing in an amount sufficient to provide optimum moisture content plus or minus 2 percent.

The subbase or base course materials shall be mixed by one of the following methods:

- (a) Stationary Plant Method - Materials mixed by means of a pug mill or other type of mixer, transported to the project at proper moisture content and placed by an aggregate spreader;
- (b) Travel Plant Method - Materials mixed and placed on the project in a continuous operation; or,
- (c) Road Mix Method - Materials mixed on the project by motor graders or other approved equipment.

207.3.03 PLACING

207.3.03A Weather Limitations

When, in the judgment of the engineer, weather conditions will be detrimental to the work, the contractor shall suspend operations until the weather is favorable. No aggregate base materials shall be placed in the snow or on a soft, muddy or frozen subgrade.

207.3.03B Equipment

Equipment necessary for construction of aggregate base shall provide for efficient and continuous operation and shall conform to the following requirements.

- (1) Hauling equipment - Vehicles for hauling aggregate or mixtures of aggregate and water shall be capable of depositing the material into or in front of spreading equipment with minimum of segregation.
- (2) Spreading equipment - The equipment shall be capable of spreading and striking off material to the designated line, grade and transverse slope with a uniform surface texture free of excessive segregation or fracture of material.

207.3.03C Thickness of Lifts

If the required compacted depth of the subbase or base course exceeds 8 inches, it shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 8 inches.

207.3.04 COMPACTION

207.3.04A Equipment

Equipment used to compact aggregate bases shall be self-propelled steel wheel or pneumatic tire rollers. Rollers shall be capable of compacting materials to a firm, even surface.

207.3.04B Density

During compaction, materials shall be maintained within 2 percent of the optimum moisture content. The Contractor shall begin compaction of each layer immediately after the material is spread and continue until a density of not less than 95 percent of the maximum density has been achieved. Maximum density will be determined by AASHTO T199 (100% Relative Maximum Density of Granular Base Materials).

If the specified compaction is not obtained, the contractor shall notify the engineer. The contractor may be required to use a modified compaction procedure or apply additional compaction effort. If approved materials meeting the specifications cannot be compacted to the required density regardless of compaction effort or method, the engineer may reduce the required density or direct that alternate materials be used. In no case shall aggregate placement proceed until the contractor is able to compact the material to the satisfaction of the engineer.

207.3.04C Frequency

Compaction test results shall be provided at the rate of one test per 500 square yards of material in place unless otherwise directed by the engineer.

207.3.05 SURFACE TOLERANCE

The surface of the aggregate base shall be within -0.04 foot to +0.02 foot of plan elevation at any one point. The final surface shall not deviate at any point more than 0.04 foot from the bottom of a 12-foot straightedge laid in any direction on the surface on either side of the roadway crown.

When directed by the Engineer, the surface shall be tested with a 12-foot straightedge furnished and operated by the Contractor. The surface shall not vary from the testing edge by more than 0.04 foot at any point. The engineer will observe this testing and may require additional testing. The average of the variation from the design grade shall not be greater than 40 percent of the allowable maximum variation.

207.3.06 AGGREGATE BASE - CURB

The Contractor shall supply base rock to be placed under the curb with minimum depth of 4" under curb. Base rock under curbs is considered incidental to curb construction, and no separate payment will be made.

207.4.00 MEASUREMENT AND PAYMENT

207.4.01 SQUARE YARD BASIS

Aggregate base will be measured on the surface to the nearest 0.1 foot. Payment will be on a square yard basis, to the nearest 0.1 square yard between the hinge points or curb lines.

207.4.02 CUBIC YARD IN-PLACE BASIS

Aggregate base will be measured and paid for on a cubic yard basis, to the nearest 0.1 yard. The thickness will be measured by depth tests, cores, or elevations.

A minimum of one measurement shall be made for each 300 square yards of material placed. The measurements shall be made to the nearest 0.01 foot.

No additional payment will be provided for measurements in excess of the specified thickness.

207.4.04 CUBIC YARD IN STOCKPILE

Aggregate base will be measured and paid for on a cubic yard basis, to the nearest 0.1 cubic yard, for the material in the stockpile.

207.4.05 TON BASIS

Aggregates will be measured and paid for on a ton basis, to the nearest 0.01 ton.

207.4.06 INCIDENTAL BASIS

When not specified nor listed in the bid schedule, base aggregates will be considered incidental work to Curb, Sidewalk, HMAC Pavement or Asphalt Trench Patch, and no separate payment will be made.

211 ASPHALT CONCRETE PAVEMENT

211.1.00 DESCRIPTION

This work consists of furnishing and placing asphalt concrete pavement as designated on the plans. Asphalt concrete paving materials and construction shall be in accordance with applicable sections

of Part 00700 of the *Oregon Standard Specifications for Construction*, current edition including all ODOT supplements.

Asphalt Patching consists of paving areas as designated on the plans as Asphalt Patching, or as directed by the Engineer. Asphalt Patching areas shall include driveways, cuts in existing pavement areas to facilitate preservation or new construction and other areas that are behind curb or involve a significant amount of hand labor to complete.

211.2.00 MATERIALS

211.2.01 GENERAL

Hot Mixed Asphalt Concrete (HMAC) shall be hot plant mixed, uniformly coated mixture of asphalt cement, graded aggregate and additives as required in accordance with the approved Job Mix Formula. HMAC shall be of the level specified for the class of street and anticipated traffic volume.

Level 1 HMAC - HMAC for use in applications with very low traffic and only limited exposure to trucks.

Level 2 HMAC - HMAC for use in applications with low traffic volumes and low volume truck traffic.

Level 3 HMAC - HMAC for use in applications exposed to moderate truck traffic.

211.2.02 AGGREGATE

Provide coarse and fine aggregates meeting the requirements of APWA Section 0074.10. Aggregates shall be hard, sound, durable, and free of deleterious substances.

(a) **Soundness** - Provide coarse and fine aggregate for soundness testing using sodium sulfate salt according to AASHTO T104. The weighted average percentage loss shall not exceed 12% by weight.

(b) **Durability** - Provide aggregate not exceeding the following maximum values:

Test	Test Method	Coarse Aggregates	Fine Aggregates
Abrasion	ASSHTO	30.0%	
Degradation			
Passing No. 20 sieve	ODOT TM208	30.0%	30.0%
Sediment Height	ODOT TM208	3"	4"

Deleterious Substances

The amount of deleterious substances in each test fraction of the crushed aggregate material shall not exceed the following values:

Test	Test Method	Course Aggregates	Fine Aggregates
Lightweight Pieces	AASHTO T113	1.0%	
Wood Particles	ODOT TM225	0.10%	
Friable Particles	ODOT TM221	1.0%	2.05%
Elongated Pieces(at a ratio of 5:1)	ODOT TM229	10.0%	
Plasticity Index	AASHTO T90		0 or NP
Sand Equivalent	AASHTO T176		45 min.

The aggregate shall be free of all other deleterious substances such as soft or disintegrating pieces, clay, loam, or vegetable matter, either in a free state or adherent to the aggregate.

211.2.03 RECLAIMED ASPHALT PAVEMENT (RAP) MATERIAL

Reclaimed HMAC Pavement material used in the production of new HMAC is optional. No more than 30% rap material will be allowed in the new HMAC pavement.

Recycled material used in HMAC pavement shall have a maximum size of 1 inch prior to entering the cold feed. Any recycled material larger than 1 inch shall be separated by screening or broken down by mechanical means to pass a 1-inch sieve, and reincorporated with the balance of the recycled material to form a mixture acceptable to the Engineer.

The recycled material shall be blended with new aggregate to provide a mix conforming to the job mix formula. If there is evidence that the recycled material is not breaking down during the heating and mixing of the asphalt concrete mixture, the Engineer may elect to modify the maximum size requirement.

211.2.04 ASPHALT CEMENT AND ADDITIVES

Provide asphalt cement conforming to the requirement of ODOT's current publication *Standard Specifications for Asphalt Materials*. The applicable specifications are those contained in the current publication on the date the Project is advertised. Use PG 64-28 or PG 70-28 asphalt unless otherwise specified in the Contract Documents. Refer to Design Standards Section 18 for asphalt binder use on various road classifications.

Asphalt in RAP material, when blended with new asphalt shall provide properties similar to the above specified asphalt. When RAP material is used at a rate of less than 30%, no adjustment to the new asphalt will be required. When utilizing RAP at a rate at or above 30%, the combined RAP and new asphalt shall provide blended properties equivalent to the specified grade. Determine the blended properties according to ASTM D 4887. Determine asphalt cement properties for the RAP material from asphalt cement recovered from the RAP according to AASHTO T 170.

Additives to prevent stripping or separation of asphalt coatings from aggregates, and admixtures used to aid in the mixing or use of asphalt mixes shall be standard recognized products of known value for the intended purpose and approved for use on the basis of laboratory tests. They shall have no deleterious effect of the asphalt material and be completely miscible. Do not use silicones as an additive.

211.2.05 MIX TYPE AND BROADBAND LIMITS

- (a) **Mix Type** - Furnish the type(s) of HMAC shown or directed. The Broadband limits for each of the mix types are specified below. When the plans show an option of two types for a course of pavement, use only one type throughout the course.
- (b) **Broadband Limits** - Provide a Job Mix Formula (JMF) for the specified mix type within the control points listed below:

Sieve Size	3/4" Dense Control Points (% Passing by Weight)		1/2" Dense Control Points (% Passing by Weight)		3/8" Dense Control Points (% Passing by Weight)	
	Min.	Max.	Min.	Max.	Min.	Max.
1"		100				
3/4"	90	100		100		
1/2"		90	90	100		100
3/8"				90	90	100
No. 4						90
No. 8	23	49	28	58	32	67
No. 200	2.0	8.0	2.0	10.0	2.0	10.0

211.2.06 JOB MIX FORMULA (JMF) REQUIREMENTS

Provide a JMF for the mixture to be used on the Project meeting the criteria set forth below. The JMF shall have been performed or verified according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete within 5 years of the date the contract was advertised. Perform a new TSR when the source of asphalt changes.

	Level 1	Level 2	Level 3
Design Method	Superpave	Superpave	Superpave
Compaction Level	65 Gyration	65 Gyration	65 Gyration
Air Voids %	3.5	4.0	4.0
VMA, % minimum	1/2" - 14.0	3/4" - 13.0	3/4" - 13.0
	3/8" - 15.0	1/2" - 14.0	1/2" - 14.0
		3/8" - 15.0	3/8" - 15.0
VMA, % Maximum	min + 2.0%	min + 2.0%	min + 2.0%
P No. 200/Eff AC ratio	0.8 to 1.6	0.8 to 1.6	0.8 to 1.6
TSR, % minimum	80	80	80
VFA, %	70 - 80	65 - 78	65 - 75

211.2.07 TOLERANCE

After the JMF is determined, the mixture shall conform to the formula within the following tolerances:

Narrow Band Tolerance (From Job Mix Formula)

Constituents of Mixture	Base and Leveling Courses	Surface Course
Aggregate Passing 1", 3/4", and 1/2" Sieves specifies in subsection 211.2.05	Within the Broadband ranges specified in subsection 211.2.05	Within the Broadband ranges specified in subsection 211.2.05
Aggregate passing 3/8" sieve	+/- 7.0%	+/- 6.0%
Aggregate passing No. 4 sieve	+/- 5.0%	+/- 4.0%
Aggregate passing No. 8 sieve	+/- 4.0%	+/- 4.0%
Aggregate passing No. 200 sieve	+/- 2.0%	+/- 2.0%
Asphalt cement content	+/- 0.6%	+/- 0.5%
Moisture content at time of discharge From the mixing plant (upper limit)	0.6% max.	0.6% max.

Compaction Density (lower limit):

(a) Normal Lift Pavement (2" +) - 92 percent of maximum density tested according to WAQTC TM 8.

(b) Control Strip Method - 98 percent of target density or 92 percent of maximum density, whichever is the lower value.

(c) Thin Lift Pavement (less than 1-1/2" compacted thickness) See 211.3.18B

(d) Open Graded Mixes - compact as directed by the Engineer.

211.2.08 MODIFICATION OF MIXES

The Engineer reserves the right to modify specified mixes for use under various traffic conditions on various segments of the work and for feathering, spot patching, and other special purposes. The Contractor shall provide mixes proportioned as directed by the Engineer for such purposes and allow

for such changes in the sequence of operations necessary for placement of the modified materials.

Upon written request from the Contractor, the Engineer may approve field adjustments to the job mix formula of up to 2 percent of the aggregate passing the 1/4-inch sieve, 1 percent for the aggregate passing the #8 sieve, and 0.5 percent for the aggregate passing the #200 sieve. These field adjustments to the job mix formula may be made by the Engineer provided the change will produce material of equal or better quality. The above adjustments, or any further adjustments ordered by the Engineer, will be considered the JMF. Adjustments beyond these limits will require development of a new JMF. The adjusted JMF, plus or minus the allowed tolerances, shall be within the broadband limits.

211.2.09 HMAC ACCEPTANCE

The mixture will be visually inspected by the Engineer. If the mixture is considered suspect, the Engineer may verify that the mixture is within acceptable tolerance limits. When requested, obtain samples according to appropriate procedures in the MFTP under the observation of the Engineer at a frequency established by the Engineer. The Engineer will test for gradation, asphalt content, moisture, and RAP content according to the procedures specified in the MFTP. The Contractor will take corrective action when testing shows that HMAC is not within acceptable tolerances.

211.3.00 CONSTRUCTION

211.3.01 PRE-PAVING CONFERENCE

The contractor and subcontractors who are to be involved in the paving work shall meet with the Engineer for a pre-paving conference at a time mutually agreed upon. At the conference, the contractor shall discuss the proposed methods of accomplishing all phases of the paving work.

211.3.02 WEATHER LIMITATIONS

Asphalt concrete shall be placed on a dry prepared surface when the surface temperature is not less than specified below:

Normal Specified Compacted Thickness of Individual courses*	Wearing Course	All Other Courses
Less than 1 1/2"	55°F	50°F
1 1/2" to 2 1/2"	40°F	35°F
2 1/2" and over	38°F	35°F

Asphalt concrete shall not be placed during rain, snow, or other adverse weather conditions, except that mix in transit at the time adverse weather conditions occur may be placed if the mix has been covered during transit and is able to be placed at the specified temperature, and if the foundation (base) is free of pools or flow of water, and provided that all other specified requirements are met. Asphalt concrete mixtures shall not be placed when the base is frozen or when, in the opinion of the Engineer or Inspector, existing or expected weather conditions will prevent the proper handling, finishing, and compaction of the asphalt mixture.

211.3.03 STREET WORK

211.3.03A Reconditioning Old Roadbed

Unless otherwise specified, the work required by this section will not be measured or paid for separately as extra work. This work shall be considered incidental to the work required for placing asphalt concrete. An asphalt tack coat shall be applied to all overlay areas and the surface of curbs to the highest pavement elevation.

211.3.03B Tack Coat

An asphalt tack coat shall be applied to all overlay areas, edges and surfaces of existing pavements, portions of concrete structures such as catch basins, manholes, and curbs that will abut asphalt pavement, and any other areas designated by the Engineer. Asphalt tack coat shall be applied by pressure spray equipment. Care shall be taken to shield areas not to directly abut asphalt concrete from being coated by asphalt tack.

211.3.03C Asphalt Concrete Placing

Asphalt shall not be matched to a transverse or longitudinal asphalt edge an end slope of less than 2:1. This requirement shall not apply where the Engineer specifies a feathered edge.

211.3.03D Asphalt Concrete Mixing Plant - DEQ Requirements

Prior to producing and furnishing asphalt concrete from a new or revised stationary plant location or a portable plant, the contractor shall furnish the following items to the engineer:

1. A current air contaminate discharge permit number for the plant being used;
2. The expiration date of the permit; and,
3. A written statement that the DEQ has been advised of the location of the plant and when operation is to commence.

The name and address of the air pollution authority having jurisdiction over the area may be obtained from the engineer.

211.3.03E Plant Scales

Scales shall be accurate to 0.5 percent throughout the range of use and shall be tested and adjusted as often as directed by the engineer to verify continued accuracy.

211.3.04 DRYING, HEATING, and SEPARATING AGGREGATES

211.3.04A Drying

Aggregates shall be dried to the extent that any retained moisture will not result in visible defects in the mixture such as slumping loads, boils, or slicks.

211.3.04B Screening

In batch plants which have screens, the aggregates shall be separated, immediately after drying and heating by screening into the sizes required for separate handling, storing and proportioning at the mixing plant.

211.3.05 HEATING ASPHALT CEMENT

Asphalt heating equipment shall be capable of uniformly heating the asphalt cement to the temperature specified.

The temperature of the asphalt cement when introduced in the mixture shall be not less than 250 degrees nor more than 350 degrees F.

211.3.06 MIXING

All the components of the asphalt concrete mixing plant shall be utilized and operated in a manner to comply with the requirements of this section. The combined materials shall be mixed until the asphalt cement is distributed thoroughly in the mixture and the aggregate particles are completely and uniformly coated.

The moisture content of the mix shall not exceed 0.60 percent at time of discharge from the mixing plant. The temperature of the mix at discharge from the plant shall not exceed 325 degrees F.

211.3.07 TRUCK SCALES

Each pay load of asphalt concrete mixture shall be weighed on vehicle scales meeting the requirements of the APWA Standard Specifications except as follows.

When vehicle scales meeting the requirements of the APWA Standard Specifications are available for check weighing, the contractor, upon written approval of the engineer, will be permitted to use an approved weigh hopper that is accurate within 0.5 percent throughout the range of use. Use of the hopper to determine pay weights will be discontinued when random check weighing's indicate that the quantities are not accurate within 0.5 percent.

Each load of mixture shall have a weigh memo provided by the contractor.

211.3.08 HAULING EQUIPMENT

Vehicles used for hauling asphalt concrete mixtures shall have tight, clean, and smooth beds which have been thinly coated with paraffin oil, lime solution, soapy water, or other approved material to prevent the mixture from adhering to the beds. Diesel oil may be used when requested by the contractor and approved by the engineer. During each application of approved coating material, and prior to loading, the vehicle bed shall be drained of all excess coating material.

Hauling vehicles shall be equipped with covers to protect against moisture intrusion and heat loss.

Vehicles which cause excess segregation, leak badly, or delay normal operations shall not be used.

211.3.09 ASPHALT CONCRETE PAVERS

Pavers shall be self-contained, power propelled units with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing layers of asphalt concrete mixture to the widths, thickness, lines, grades and cross sections required on the project.

The paver shall be equipped with a receiving and distribution system of sufficient capacity for a uniform spreading operation and capable of placing the mixture uniformly in front of the screed without segregation of materials. Extensions added to the paver when used on travel lanes shall have the same augering and screeding equipment as the rest of the paver. The paver shall be equipped with either a manual or electronic line and grade control. When applicable, a windrow pick-up machine shall be used in lieu of an end dump machine.

The paver shall be designed so that minor irregularities in the surface of the base material will not be reflected in the surface of the layer being placed. The weight of the paver shall be supported on tracks or wheels, none of which shall contact the surface being placed. The contact area of the screed or strike-off assembly shall be uniform over the entire width of the mixture being placed and shall produce a finished surface of the required smoothness and texture without tearing, shoving, or gouging the mixture.

211.3.10 COMPACTORS

Rollers shall be steel wheel, pneumatic tire, vibratory or a combination of these types. They shall be in good condition and capable of reversing without backlash.

211.3.10A Steel Wheel Rollers

Steel wheeled rollers shall have a minimum gross static weight of 8 tons, and a minimum static weight on the drive wheel of 250 pounds per inch of width. For finish rolling, a 6-ton minimum gross static weight is acceptable with the 250 pounds per inch of width not required.

211.3.10B Vibratory Rollers

Vibratory rollers shall be equipped with amplitude and frequency controls and shall be specifically

designed for compaction of asphalt concrete mixture. The rollers shall be capable of frequencies of not less than 2,000 vibrations per minute.

211.3.10C Pneumatic Rollers

The pneumatic-tired rollers shall be self-propelled, tandem, or multiple axle, multiple wheeled with smooth-tread pneumatic tires. The tires shall be of equal size and staggered on the axles at spacings and overlaps that will provide uniform compacting pressure for the full compacting width of the roller. Ground pressures shall be at least 80 pounds per square inch of tire contact area. Pneumatic-tired rollers shall be fully skirted to insulate the tires from significant heat loss during compaction.

211.3.11 PREPARATION OF FOUNDATION

All bases and foundations on which pavement is to be constructed shall meet the applicable specifications and be approved by the Engineer prior to the start of paving. Existing bases and foundations shall be reconditioned as specified or as directed.

Broken or ragged edges of existing paved surfaces underlying or abutting the new pavement shall be trimmed back to firm material with a clean vertical edge. Surfaces against which asphalt concrete is to be placed shall be treated with an asphalt tack coat as specified in Section 00730 of the *Oregon Standard Specifications for Construction*.

Depressed areas in existing pavement shall be tacked and leveled with an approved asphalt concrete mixture and compacted with a pneumatic tired roller. This leveling work shall be a separate operation and performed as specified. Leveling material shall be spread by means of a paving machine except in small or irregular areas where the engineer may permit the use of other equipment. At the direction of the Engineer, leveled areas shall have asphalt tack applied prior to placement of subsequent material.

211.3.12 ASPHALT CONCRETE STORAGE

Temporary storing or holding of hot asphalt concrete mixture in storage silos up to 24 hours will be permitted. Trucks shall be loaded from the storage silos in a manner that prevents segregation.

Storing or holding of hot asphalt concrete mixture in open stockpiles will not be permitted.

211.3.14 CONTROL OF LINE AND GRADE

When specified in the contract, the engineer will establish references at reasonable intervals for line and grade control of the placing operations. The contractor shall furnish, place, and maintain supports, wires, devices, and materials as necessary to provide continuous line and grade reference control to the automatic paver control system on either or both sides of the paving machine.

With approval of the engineer, the line and grade reference control may be a floating beam device or multi-footed ski of a length and sensitivity that will control of the paver to the grade specified. After the paving of the first lane, a joint matcher or manual control of line and grade will be permitted with approval of the engineer.

211.3.15 SPREADING, TEMPERATURE CONTROL, AND FINISHING

211.3.15A Spreading

1. General - Asphalt pavers conforming to subsection 211.3.09 shall be used to distribute the mixture. Placing of the mixture shall be continuous and uniform. In areas where patching, irregularities, or unavoidable obstacles make the use of specified equipment impracticable, the mixture may be spread with other equipment approved by the Engineer.
2. Drop-offs - When placing asphalt concrete pavement under traffic in courses in excess of a 2-inch thickness, work shall be scheduled so that at the end of each working shift the full width of

the area being paved, including shoulders, shall be complete to the same elevation with no longitudinal drop-offs.

When placing asphalt concrete pavement under traffic in courses between 1 and 2 inches in thickness, work shall be scheduled so that at the end of each working shift a strip of new pavement shall not extend beyond the adjoining strip of new pavement more than a distance normally covered by each shift. Prior to any suspension of operations for a period of one day or more, the full width of the area to be paved, including shoulders, shall be completed to the same elevation with no longitudinal drop-offs.

The transverse drop-offs at the end of each strip shall be feathered out in accordance with subsection 211.3.16.

Where abrupt or sloped drop-offs occur within or at the edge of the paved surface, the contractor shall provide suitable warning signs.

3. Construction Joints - The width of the pavement strips shall be adjusted to minimize the number of longitudinal joints required. Longitudinal joints in the wearing course shall be at a lane line or the edge line of a traffic lane. On median lanes and on shoulder areas, joints shall occur only at points designated by the Engineer. The longitudinal joints in one layer or lift shall offset with those in the layer immediately below by a minimum of 6 inches. Underlying longitudinal joints shall be within 12 inches of the edge of a lane or within 12 inches of the center of a lane, except in irregular areas.

211.3.15B Temperature of Mixture

The temperature of the mixture at the time it is placed in final position shall be within 10 degrees of 280°F. The engineer may adjust the lay-down temperature in 10-degree increments to attain maximum workability and compaction. In no case shall the lay-down temperature of mixture be less than 240°F.

211.3.15C Finishing and Details

Segregation of materials, non-uniform texture, fouled surfaces preventing full bonding between lifts of mixture, and other defects determined by the engineer as detrimental, shall be corrected by the contractor at no expense to the owner.

211.3.16 JOINTS

211.3.16A Transverse Joints

On wearing courses, pavement depth, line and grade shall be maintained at least 4 feet beyond the selected transverse joint location. On all courses, a sloped end section shall be constructed. If subject to traffic, the end section shall be sloped at not less than 20.1. If not subject to traffic, the end section shall be sloped at a minimum of 10.1.

When paving is not expected to continue from the transverse joint until the following day or later, paper or other suitable material shall be placed under the material ahead of the transverse joint location.

Prior to continuing the permanent paving lift, the contractor shall remove the material beyond the joint to a vertical face against which paving will resume. The base shall be cleaned of all debris. A tack coat shall then be applied to the vertical edge and surface of the exposed area before paving is continued.

After placement and finishing of the new asphalt concrete, both sides of the joint shall be compacted to the specified density. The joint surface shall conform to the requirements of subsection 211.3.19.

211.3.16B Longitudinal Joints

Pre-determine panel widths to minimize the number of longitudinal joints. For base lifts,

longitudinal joints must be within 12 inches of the lane edge. For the surface lift, longitudinal joints must be at the edge of the lane and may not be located directly above the joint in the base lift immediately below. When paving, the roller shall start on the hot mat with the edge of the roller wheel 6 inches from the joint to “pinch the joint”. On the second and subsequent compaction passes the roller will roll over the joint with more than half the roller on the hot mat to avoid compacting the cold mat. Any hand raking must be carefully done to avoid segregation of the mix.

211.3.17 THICKNESS AND NUMBER OF LAYERS

The mixture shall be placed in the number of lifts and to the compacted thickness of each lift as shown on the plans. If the compacted thickness of each lift is not shown on the plans, the maximum compacted thickness for any lift shall be 3 inches. Minimum compacted thickness for ½ inch dense graded mix is 2 inches. Maximum compacted thickness for ½ inch dense graded mix is 3 inches. Minimum and maximum compacted thickness for ¾ inch dense graded mix is 3 inches.

211.3.18 COMPACTION

Immediately after the asphalt concrete mixture has been spread, struck off and surface irregularities and other defects remedied, it shall be thoroughly and uniformly rolled until the mixture is compacted.

211.3.18A General

The type, number, and weight of rollers shall be sufficient to compact the mixture while it is still within the specified temperature range. Between October 1 and April 1, pneumatic-tired rollers shall be used for breakdown compaction except on the wearing course where a single coverage with a vibratory or steel-wheel roller shall precede pneumatic-tired rolling. The use of equipment which crushes the aggregate will not be permitted. Rollers shall not be operated in vibratory mode when the temperature of the mixture has dropped below 180 degrees.

Steel roller wheels shall be moistened with water or other approved material to the least extent necessary to prevent pickup of mixture and not cause spotting or defacement of the surface of the mixture

Rollers shall be operated at speeds recommended by the roller manufacturer and slow enough to avoid displacement of the mixture. The maximum speeds shall be 3 miles per hour for vibratory rollers, 4 miles per hour for steel-wheeled rollers, and 5 miles per hour for pneumatic-tired rollers.

Care shall be exercised not to displace the line and grade of edges. Displacement of any course occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of approved rakes and addition of fresh mixture when required.

Any mixture that becomes loose and broken, contaminated, segregated, or is in any way defective, shall be removed and replaced with new mixture at no expense to the owner.

Finishing rolling shall continue until all roller marks are eliminated.

Along curbs and walls, on walks, irregular areas, and other areas not practicably accessible to specified rollers, the mixture shall be compacted with approved self-propelled rollers, mechanical tampers, hot hand tampers, or heavy hand rollers. On depressed areas, a trench roller may be used, or cleated compression strips may be used under the roller to transmit compression to the depressed area.

211.3.18B Density Requirements

For a specified lift thickness of less than 1½ inches, the mixture shall be compacted with at least four passes by rollers, excluding finish rolling.

For a specified lift thickness of 1½ inches or greater, the mixture shall be compacted to at least 92 percent of the theoretical maximum density as determined by AASHTO T209.

The engineer may allow the contractor to establish a target density by use of a 200-foot control strip conforming to the Control Strip Method Specified in the ODOT Standard Specifications. The contractor shall retain an independent testing firm to perform the compaction testing. Contractor shall attain 98% of target density for duration of the job.

All additional costs associated with the use of the control strip method shall be borne by the contractor.

211.3.19 PAVEMENT SMOOTHNESS

The top surface of the asphalt concrete pavement shall not vary by more than ¼” when tested with a 12-foot straightedge either parallel with or perpendicular to the centerline. The straightedge shall be furnished and operated by the contractor. The engineer will observe this testing and may require additional testing.

The joint between the pavement and the top surface of utility structures, such as manhole covers and valve boxes located in the traveled way, shall meet the pavement surface tolerances.

The surface of the finished pavement shall be within ¼” of the specified line, grade and cross section.

The contractor shall correct any surface tolerance deficiency by a method that has been approved by the engineer. All corrective work shall be completed within 10 workdays following notification from the engineer. All corrective work, including furnishing of materials, shall be performed at the contractor’s expense and no adjustment in contract time will be made.

211.3.20 SPECIAL PROTECTION UNDER TRAFFIC

No traffic or equipment shall come in contact with the compacted mixture until it has cooled and set sufficiently to prevent marking. Edges shall be protected from being broken down, and edge drop-offs 1 inch or more in height shall be marked with warning devices visible by day and night to the traveling public and placed at spacing as specified or as directed by the engineer.

211.3.21 TEMPORARY PAVEMENT MARKINGS

During paving operations, lane markings shall be maintained throughout the project by applying temporary lane stripes to the roadway each day. Temporary striping shall consist of strips of pavement marking tape a minimum of 1 foot in length on the lane separation line to delineate the path of travel for vehicles. Intervals between marking strips shall be a maximum of 25 feet.

The pavement marking tape shall be 4 inches wide, pressure sensitive, reflective tape of a form suitable for marking asphalt or concrete pavement surfaces. Biodegradable tape with paper backing will not be allowed. Surface preparation and application shall be in conformance with the manufacturer’s specifications.

The pavement marking shall be maintained in serviceable condition by the contractor during the interval of time it is in use. All preliminary layout and marking in preparation for application and the application of the temporary striping shall be the contractor’s responsibility. If specified, the contractor shall remove the temporary striping prior to placement of subsequent paving materials or permanent lane markings.

211.3.22 SAMPLING AND TESTING

The contractor is responsible for process control and shall conduct sampling, testing, measurement and inspection as necessary to ensure the finished pavement meets specifications.

The engineer will determine the suitability of the final product through final acceptance testing. Results of these tests will be used to determine payment deductions, if any to be assessed against the contract.

The engineer shall be permitted to cut samples or to take cores from the compacted mixture for testing purposes. Where samples have been taken, the contractor shall furnish new material and fill the holes as directed with no compensation beyond the unit price for asphalt concrete in place.

211.3.22A Aggregate Gradation and Asphalt Content

The contractor shall take samples from the grade on a random basis in the presence of the inspector for testing by the engineer. A minimum of three samples shall be taken for each 1,000 tons of asphalt concrete or portion thereof.

211.3.22B Compaction

For final acceptance of the pavement, the density of each section of pavement will be determined by random acceptance tests using a nuclear gauge or laboratory analysis of pavement core samples. Density tests will be taken at five randomly selected sites for each section of pavement. The average of the five density tests will constitute the density of the pavement.

A section of pavement will be the area constructed from 500 consecutive tons of mixture or portion thereof. Acceptance tests will not be made within one foot of the edges of the panel or from areas where the specified compacted thickness is less than 1 ½ inches.

When using a nuclear gauge, two readings will be obtained at each site, the second at right angles to the first. The two readings will be averaged to obtain the test density. For any section of pavement, if the contractor requests in writing within two work days after nuclear gauge test results are furnished to the contractor, pavement cores will be obtained at the same randomly selected sites used for the nuclear gauge tests. The density of the core samples will constitute the in-place density of the section of pavement and will prevail over nuclear results. If the Density as determined by the core samples does not meet density requirements, the contractor shall bear the cost of coring and testing.

The engineer shall have the right to test any areas that appear defective in compaction. If the areas are found deficient, the engineer may require the contractor to bring the areas into conformance with the specifications.

211.3.22C Pavement Thickness

The engineer will select locations for non-destructive measurement of core samples to determine pavement thickness.

If non-destructive measurement indicates a pavement section is less than the thickness shown on the plans, or is otherwise out of specification, the contractor may take cores at the same locations to verify the engineer's measurements. If the pavement section is found to comply with specifications, the coring and restoration will be paid for as extra work. Pavement found to be out of specification shall be subject to replacement or to payment at adjusted prices.

In determining deficient or excessive thickness in asphalt concrete overlays, the engineer shall adjust the cross-section measurement sequence, average series of measurements, or take other appropriate steps to allow for the desirable leveling of low or high areas on the existing pavement.

Where a deficiency is found and the engineer determines the deficiency serious enough to impair the traffic service expected from the pavement, the area of such deficiency shall be removed by the contractor and shall be replaced with pavement meeting the specifications. The cost of the deficient pavement and of the removal shall be borne by the contractor.

211.4.00 MEASUREMENT AND PAYMENT

211.4.01 TON BASIS

Asphalt concrete will be measured and paid for on a ton basis, to the nearest 0.01 ton. There will be no separate measurement or payment for asphalt cement contained in the mixture

211.4.02 SQUARE YARD BASIS

When listed in the Bid Schedule, Asphalt concrete will be measured on the surface to the nearest 0.1 foot. Payment will be made on a square yard basis, to the nearest 0.1 yard.

211.4.03 SEPARATE TONNAGE OF MIXTURE AND ASPHALT CEMENT

(a) When the bid schedule so indicates, the quantities of asphalt concrete mixture and asphalt cement contained in the mixture will be measured and paid for separately as follows: Asphalt concrete mixture will be measured and paid for on a ton basis, to the nearest 0.01 ton. No deduction will be made for the weight of the asphalt cement or any additive used in the mixture as required by the specifications or ordered by the engineer.

(b) Asphalt cement will be measured and paid for on a ton basis, to the nearest 0.01 ton. If invoice and tank level measurements are not available, the quantities shall be based on extraction tests.

211.4.04 PATCHING AND LEVELING

Patching and leveling work will be measured and paid for in conformance with subsection 211.4.01.

211.4.05 PAYMENT DEDUCTIONS AND REJECTION OF PAVEMENT

211.4.05A Aggregate Gradation and Asphalt Content

A deduction of 1.0 percent of the in-place price for asphalt concrete and cement will be made for each 1.0 percent cumulative weighted deviation beyond the allowable tolerance of each component of the job mix formula specified in subsection 211.2.09.

The following factors shall be used to calculate deductions due to deviations from the job mix formula.

Deviation Weighting

Asphalt Cement	12 x Deviation
200 minus	3 x Deviation
#10	1.5 x Deviation
#40	1.5 x Deviation
All Other Sizes	1 x Deviation

The cumulative weighted deviation is the sum of all weighted deviations as determined from the table above.

A minimum of three samples as a lot shall be averaged to determine any reduction in payment. Where the cumulative weighted deviation equals or exceeds 15.0 percent, the materials shall be removed and replaced at no cost to the owner.

When asphalt paving materials with a cumulative deviation of less than 15.0 percent are furnished, the engineer may require the contractor to remove and replace defective materials at no cost to the owner or shall deduct from payments to the contractor an amount equal to the cumulative weighted percentage deviations from the job mix formula.

211.4.05B Compaction

Asphalt concrete pavement that does not comply with compaction requirements shall be removed and replaced or, at the discretion of the engineer, be subject to a price reduction determined from the following table:

PRICE REDUCTION SCHEDULE

% MAXIMUM DENSITY (Normal Method)	% Pay*	% TARGET DENSITY (Control Strip Method)
92.0 and above	100	98.0 and above
91.5 – 91.9	95	97.5 – 97.9
91.0 – 91.4	90	97.0 – 97.4
90.5 – 90.9	85	96.5 – 96.9
90.0 – 90.4	80	96.0 – 96.4
89.5 – 89.9	70	95.5 – 95.9
89.0 – 89.4	60	95.0 – 95.4
Below 89.0	0	Below 95.0

* Applies to price for in-place asphalt concrete, including asphalt cement where measured and paid for separately on City of Sisters Public Works contract.

211.4.05C Pavement Thickness

In determining payment reduction for deficient or excessive pavement thickness, a section of pavement will normally be on full roadway station (100 lineal feet). For non-roadway paving and in other situations where the engineer determines the above section is inappropriate, the engineer may establish a different unit of work on which to calculate average thicknesses and price reductions.

When pavement thickness, as determined by the engineer’s measurements or test cores, is found deficient by more than the thickness of the specified surface course of asphalt concrete, the engineer may allow the contractor to place an additional lift of asphalt concrete to bring the total thickness of the pavement into conformance with the specifications.

When the thickness in any section of pavement is found deficient by less than the specified thickness of the surface course, and the engineer allows the pavement to remain in place, payment for that pavement will be made at an adjusted price determined from the following table:

% REDUCTION IN PAY * (Payment on Weight Basis)	% DEFICIENCY IN THICKNESS	% REDUCTION IN PAY * (Payment on Area Basis)
No deduction	0.0 – 5.0	No Deduction
No deduction	5.1 – 10.0	1.0 x Deficiency
0.5 x Deficiency	10.1 – 20.0	1.5 x Deficiency
1.0 x Deficiency	20.1 – 30.0	2.0 x Deficiency

* Applies to price for in-place asphalt concrete, including asphalt cement where measured and paid for separately.

No payment will be made for any area of pavement found deficient in thickness by more than 30.0 percent even though the work is permitted by the engineer to remain in place.

212 ASPHALT CONCRETE PATCHING

212.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00495 of the *Oregon Standard Specifications for Construction*, current edition shall apply.

212.1.01 GENERAL

Asphalt patching will be required under two general situations:

- a. In new construction asphalt patching shall include driveways, trenching in existing pavement areas and other such areas that are behind the curb and/or involve a significant amount of hand labor to complete the work; and
- b. In existing pavements where the scope of the work is primarily paving underground utility trenches.

212.2.00 MATERIALS

212.2.01 Backfill

- a. Class C Backfill
See Division 1 Trenches.
- b. Cement Treated Base
See Division 1 Trenches.
- c. Pipe Bedding and Pipe Zone
See Division 1 Trenches.

212.2.02 Aggregate Base Shall conform to Section 207.

212.2.03 Asphalt Concrete Shall conform to Section 211.2.00.

212.2.04 Temporary Cold Mix AC Patches Patches constructed of cold mix AC will be acceptable during times when hot mix plants are not operating or to meet temporary trench surfacing requirements. Cold mix AC shall meet the requirements of Section 00735 of the *Oregon Standard Specifications for Construction*. All cold mix patches shall be dug out and replaced with hot mix patches when hot mix AC becomes available.

212.3.00 CONSTRUCTION

212.3.01 PREPARATION

212.3.01a Sawcutting

The existing pavement shall be saw cut back to undisturbed areas and the edges shall be straight and vertical. Saw cuts are not permitted in the wheel line and must be located in the center or edge of the lane. Pavement previously sawcut for trenching and damaged during construction must be re-cut to a continuous straight line. A sawtooth pattern to the edge of the pavement patch is not allowed.

212.3.01b Tacking

All existing pavement or concrete surfaces shall be uniformly tacked with asphalt by brushing or spray equipment. A mist or fog application of tack is not sufficient, and surfaces must be fully coated.

212.3.02 BASE MATERIAL

This work includes furnishing, fine grading and compacting crushed rock base material at the depth specified under all patching areas. If aggregate base has been placed by trenching contractor, the

paving contractor is expected to ensure that road base material meets the thickness and gradation requirements and to re-grade and make up material as required constructing the asphalt patch as specified. Base material that has been contaminated by dirt shall be removed.

212.3.03 PAVING

The pavement patch shall be a minimum of 8 inches of aggregate base and 4 inches of hot mix asphalt concrete. Where the existing section is deeper, the patch shall match the existing section. The asphalt shall be placed in two lifts and shall be thoroughly compacted between lifts. The second lift shall be raked sufficiently higher than the existing pavement so that upon compaction the finished surface will match the existing grade without a dip. When checked with a 4' straightedge, a variation of more than 1/4" from the true line and grade shall be cause of rejection of the patch.

Asphalt concrete shall be placed and raked such that, when compacted, the surface will be uniform and smooth and shall match abutting pavement edges. When checked with a 4' straightedge, a variation of more than 1/4" from true line and grade shall be cause for rejection of the patch.

Compacting shall be performed with a steel wheeled roller having a minimum weight of 4 tons and shall continue until roller wheel marks are no longer discernible. In confined asphalt patch areas where a larger roller is not practicable, the largest steel wheel roller capable of operating in the asphalt patch area shall be used for breakdown compacting. A vibratory plate compaction device may be used for finishing. A vibratory plate compaction device may be used in small asphalt patch areas for both breakdown and finishing with the approval of the Engineer. Where no mechanical means can be used for compaction and finishing a hand tamper shall be used.

212.3.04 TEMPORARY PAVEMENT RESTORATION

To comply with the requirement of pavement restoration within 48 hours of removal or disturbance, the contractor may provide temporary patching. The temporary patching shall be a hard surface consisting of asphalt concrete, asphalt concrete cold mix. CTB (Concrete Treated Base) may be used, but the top portion will require grinding to provide appropriate AC replacement for permanent restoration. Between construction and the end of the 48-hour period, the street surface may be maintained with backfill or crushed rock provided that no subsidence occurs.

212.3.05 SEALING PATCH EDGES

Completely seal all adjoining asphalt concrete surfaces with an edge sealing tack coat. After the tack coat has been placed, place clean sand over the top of the tack coat.

212.4.00 MEASUREMENT AND PAYMENT

212.4.01 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, ASPHALT CONCRETE shall be considered incidental work for which no separate payment will be made.

212.4.02 ASPHALT CONCRETE PER TON BASIS

When listed in the Bid Schedule, ASPHALT CONCRETE will be measured by the ton to the nearest 0.01 ton. The Contractor shall provide weigh tickets from certified scales to prove the ASPHALT CONCRETE tonnage. Payment for ASPHALT CONCRETE will be at the contract unit price bid per ton of the class of asphalt specified, complete in place.

214.4.03 ASPHALT CONCRETE PATCHING

When listed in the Bid Schedule, ASPHALT CONCRETE PATCHING will be measured by the square yard to the nearest full square yard. Payment for ASPHALT CONCRETE PATCHING will be at the contract unit price bid for ASPHALT CONCRETE PATCHING. This payment shall include full

compensation for all labor, equipment, and materials required to perform the work.

212.4.04 ASPHALT CONCRETE PATCH-TRENCH

When listed in the Bid Schedule, ASPHALT CONCRETE PATCH-TRENCH will be measured by the linear foot of trench over the installed utility measured on a horizontal plane. Payment for ASPHALT CONCRETE PATCH-TRENCH will be at the contract unit price bid for ASPHALT CONCRETE PATCH-TRENCH. This payment shall include full compensation for all labor, equipment, and materials required to perform the work.

212.4.05 ASPHALT TACK COAT AND EDGE SEALING TACK COAT

No separate measurement or payment will be made for furnishing and applying asphalt tack coat or crack seal. Full compensation for tack coat shall be included in the contract unit price bid for asphalt concrete, or asphalt patching, or other items as listed in the Bid Schedule.

212.4.06 AGGREGATE BASE

Where no separate pay item exists for Base Rock, base rock will be considered an incidental item to the work required, and full compensation for base rock shall be included in the price bid for Asphalt Pavement, Patching, or other items of work as listed in the Bid Schedule.

213 CURBS AND GUTTERS

213.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00759 of the *Oregon Standard Specifications for Construction*, current edition shall apply.

This work consists of furnishing, placing and finishing commercial grade concrete curbs, gutters, combination curb and gutter, combination curb, gutter and sidewalk, islands, and traffic separators, hereinafter collectively referred to as structures.

An incidental item included in this work shall be to stamp an "S" or "W" in the concrete curb at all locations where a sewer or water service line crosses under the curb.

The work included in CURB BACKFILL provides for the placing of clean backfill material behind the curbs, between the curb and sidewalk, behind sidewalks, and behind walls, at the grades and slopes shown on the plans.

213.2.00 MATERIALS

213.2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the applicable requirements of Section 00440 of the *Oregon Standard Specifications for Construction*, current edition.

Unless otherwise specified, commercial grade concrete shall conform to ODOT Class 3000. Portland Cement shall be Type I or type II. Air entrainment shall be between 4% and 7% as determined by AASHTO T 152 at the time of placing. The chloride content of any admixtures shall not exceed 0.5% by weight for applications with imbedded steel and shall not exceed 2% by weight for applications without imbedded steel. Set accelerating admixtures shall meet the requirements of AASHTO M 194 (ASTM C494, type C or E.)

The amount of deleterious substances shall not exceed the following limits:

Friable Particles	1% (by weight)
Lightweight Particles	1% (by weight)

Material Passing No.200 sieve

4% (by weight)

Concrete supplier shall provide batch tickets for each load to verify mix ingredients.

213.2.02 AGGREGATE BASE

Aggregate base shall conform to the requirements of Section 207.

213.2.03 CURB BACKFILL

Class A backfill material shall be placed behind the curbs, between the curb and sidewalk, behind sidewalks, and behind walls, sloping it as shown on the standard drawings. The top 8" of the backfill shall be good quality topsoil. Topsoil shall be a fertile, loamy, natural surface soil, well-graded and free from substances toxic to plant growth, noxious weeds, roots, refuse, sticks and lumps. Topsoil material shall be spread smoothly over the specified areas to the thickness, grades and slopes indicated on the plans or as otherwise ordered by the Engineer. Compaction shall be performed by a mechanical tamper or other method approved by the Engineer until the material is firm and unyielding. The finished surface shall be raked by hand.

213.3.00 CONSTRUCTION

213.3.01 PREPARATION OF SUBBASE AND BASE

Curb sub-base and base shall be constructed to the grades, and slopes indicated by the plans or as otherwise ordered by the Engineer. Sub-base shall be compacted to 95% of maximum density as determined by AASHTO T-99 prior to placing aggregate base material. Aggregate base shall be compacted to 95% of maximum density prior to placing curbs.

213.3.03 PLACING, FINISHING, AND CURING

213.3.03A Tolerances

The top and face of the finished curb shall be true and straight. The top surface or face shall not vary more than 1/4" from the edge of a 10-foot straightedge, except at changes in grade or in curves.

213.3.03B Finishing

Concrete shall be finished to a smooth and uniform texture by troweling and floating. The surface shall have a light broomed finish transverse to the direction of traffic, unless otherwise specified.

213.3.03C Curing

Concrete shall be cured by application of a liquid membrane forming compound applied uniformly to the damp concrete by pressure spray methods, or by keeping the concrete protected by covering and moist for a minimum of 72 hours. Curing compounds shall conform to the requirements of AASHTO M 148. All compounds shall be Class A. Solvent based compounds shall be Type 1-D.

Concrete curbs shall be allowed to cure for a minimum of 72 hours before starting spreading and compaction operations for aggregate base against or within 2 feet of new curbs. Curbs cracked, chipped or damaged by equipment operations shall be removed and replaced prior to paving. Curbs shall be replaced in sections by sawcutting at the nearest expansion joints.

213.3.03D Weather limitations

1. Concrete is to be placed when the air temperature is at least 25°F and rising.
2. Concrete shall not be placed on frozen ground. Frost and ice shall be removed from all forms, reinforcing steel, imbedded items, and subgrade.
3. Concrete from the chute shall have a temperature of not less than 55° F.

4. Concrete work shall be protected from freezing for at least seven days after placement. A curing sealant or impervious material shall be placed on the concrete.
5. The inspector can require the Contractor to provide a minimum recording thermometer, having not less than 2-degree divisions, to verify that the temperature at the surface of the work does not fall below 32° F. The reading shall be taken as close to the surface of the concrete as possible.
6. Any concrete indicated as being damaged from freezing shall be rejected and replaced by the contractor at no additional cost to the City.

213.3.04 EXPANSION JOINTS

Expansion joints in curbs shall be placed at no less than 100' spacing. Expansion joints are required on both sides of driveway approach where the top of the flare or wing meets the sidewalk, and at each point of tangency in the structure alignment.

213.3.05 CONTROL JOINTS

Concrete shall be scored with control joints at intervals not exceeding 15', or over contraction joints in concrete underlying the structure. Control joints shall be scored into the concrete a minimum of 1/3 the depth.

213.4.00 MEASUREMENT AND PAYMENT

213.4.01 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, Curb and Curb Backfill shall be considered incidental work for which no separate payment will be made.

213.4.02 CURB

Concrete curb shall be measured to the nearest foot on a linear foot basis along the face of the curb for the actual length constructed. Payment for concrete curb will be at the price bid for concrete curb of the type and size specified and listed in the proposal.

213.4.03 CURB BACKFILL

When listed as an item in the Bid Schedule, Curb Backfill material will be measured by the linear foot of curb backfilled to the nearest foot. Payment for curb backfill will be at the contract bid unit price per linear foot of backfill, which price shall constitute full compensation for supplying and placing curb backfill.

214 DRIVEWAYS AND APPROACHES

214.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00759 of the *Oregon Standard Specifications for Construction*, current edition shall apply.

This work consists of forming, furnishing, placing and finishing Portland cement concrete driveways and approaches only. Asphalt concrete driveways shall be covered under Section 212 as ASPHALT PATCHING.

Driveways are considered to be that portion of paved vehicular access that lies behind the sidewalk or driveway approach and are located on private property. Approaches shall also be referred to as aprons and are generally a transition section between the grade of the gutter or edge of asphalt and the grade of the top of the sidewalk/pedestrian path. Where there are no sidewalks the approach/apron is the area between the edge of asphalt and the property line.

214.1.01 GENERAL REQUIREMENTS

Driveways off all street classifications shall conform to the City of Sisters Access Management Standards. Direct access to an arterial street should be avoided whenever practical and is subject to approval by the City Engineer or Director of Public Works. Concrete Driveway Aprons are required on all new commercial and industrial construction, except asphalt aprons approved by ODOT (Permit required). Driveways to multi-family residences (excluding duplexes) shall meet commercial/industrial standards. Asphalt approaches are allowed for single family residences where concrete sidewalks do not exist.

Driveways on local streets should be spaced a minimum of 10' apart measured from the top of transition or at the terminus of the radius to the edge of the roadway. The maximum practical spacing should be sought.

The distance between an intersection of a local street and the first driveway shall be a minimum of 50 feet, unless variance is approved by City Engineer. The distance shall be measured from the point of tangency of the intersection curb to the nearest edge of the first driveway. The City Engineer may determine the minimum distance for commercial streets and industrial to be greater, dependent upon frontage and type of expected traffic (See Table 7-2 of the 2018 Sisters Transportation Plan).

Residential driveway maximum width shall be 20'; commercial/Industrial driveway maximum width shall be 36', unless a variance is granted. Each lot shall have a maximum of one driveway approved through either a building permit approval (residential) or access permit approval (commercial/industrial) unless a variance is granted by the City Engineer.

214.2.00 MATERIAL

214.2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the requirements of Section 213.2.01.

214.2.02 AGGREGATE BASE

214.2.02A - Portland Cement Concrete Base aggregates for PCC driveways and approaches shall consist of Class C material meeting the requirements of Section 101.2.02C.

214.3.00 CONSTRUCTION

Driveway aprons shall be 6" thick, or as shown on the plans. Any transition from 6" to 4" thickness shall not occur in the apron. Single Family residential approaches shall be a minimum of 3" in depth or match the existing street section if greater than 3".

214.3.01 PREPARATION OF SUBBASE AND BASE

Preparation of subbase shall conform to the requirements of section 213.3.01 and the following. If the in-situ material does not meet the material specification for base, then the base shall be excavated 10 inches from finish grade, raked smooth of large rocks and other organic material, and 4 inches of base placed and compacted per standard drawing. If the in-situ material meets the specification for base, as proven by the Contractor and verified by the City Engineer, then the base shall be excavated 6 inches from finish grade, raked smooth of large rocks and other organic material, and compacted.

A minimum of one test every 300 feet, or as directed by the City Engineer, is required. Costs of passing tests are the responsibility of the City. Costs of failing tests are the responsibility of the Contractor.

214.3.02 PLACING, FINISHING, AND CURING PORTLAND CEMENT CONCRETE

This work shall conform to the requirements of Subsection 213.3.03 and the following.

Finish concrete surfaces to smooth and uniform texture by troweling, floating and cross brooming. Lightly groove or mark surfaces into squares or other shapes to match markings on similar existing surfaces in the vicinity, as directed.

On all sidewalk ramps and accessible route islands, install truncated domes as shown. Place according to the manufacturer's recommendation.

Keep the concrete structure free from contact, strain and public traffic for at least seven calendar days or longer as directed. Do not apply curing compounds to the designated truncated dome areas of sidewalk ramps and accessible route islands.

214.3.03 EXPANSION JOINTS

Expansion joints are required at ends of driveway in accordance with the standard drawings.

214.3.04 CONTRACTION JOINTS

Contraction joints are required at the center of the driveway in accordance with the standard drawings.

214.4.00 MEASUREMENT AND PAYMENT

214.4.01 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, Driveways and Aprons shall be considered incidental work for which no separate payment will be made.

214.4.02 DRIVEWAYS

Driveways shall be measured on a square foot basis to the nearest whole square foot. Payment for driveways shall be at the unit price bid at the thickness and measurement unit specified.

214.4.03 DRIVEWAY APRONS

Aprons shall be measured on a square foot basis to the nearest whole square foot. Transition sections from apron to sidewalks shall not be measured. Payment for aprons shall be at the unit price bid at the thickness and measurement unit specified.

215 SIDEWALKS AND PATHWAYS

215.1.00 DESCRIPTION

Except as modified or supplemented herein, the provisions of Section 00759 of the *Oregon Standard Specifications for Construction*, current edition shall apply. The work covered in this section consists of forming, placing, and finishing standard Portland Cement Concrete sidewalks and pathways in accordance with standard drawings 2-12 to 2-18. This section also covers colored Portland Cement Concrete and interlocking paver sidewalks in accordance with standard drawings. The construction of asphalt concrete pathways and sidewalks shall conform to specifications Section 211.

215.1.01 GENERAL REQUIREMENTS

Structures, such as fire hydrants and central delivery mailboxes, shall not be located in the sidewalk except as approved by the City Engineer. The back edge of the sidewalk shall smoothly meander back from the central delivery mailbox station to provide a 5' wide unobstructed pathway. No portion of the mailbox shall be within 12" of the curb.

Sidewalks constructed abutting the property line are the most desirable. When sidewalk is placed abutting curb, the sidewalk shall be poured separate from the curb. When a sidewalk meanders from the curb the alignment may require special approval; and the following conditions shall be met:

The sidewalk shall generally follow a smooth and gradual alignment free of sharp angles or bends. Horizontal curves shall not be less than 20-foot radius. The centerline of the sidewalk shall not meander more than 35 feet from the street curbline. All sidewalks shall be within the right-of-way or, in particular situations where topographical or vegetation limitations require sidewalks out of the right-of-way, Public Access easements shall be provided. The location of meandering sidewalks shall be shown on the plans and profile as a condition for approval by the City Engineer.

Sidewalk grades shall not exceed 5% greater than the existing street grade and in no case greater than a 15% grade. The total vertical separation between the top of curb and the top of the sidewalk shall not be greater than 10 feet. In no case shall the cross slope of the parking strip between the curb and the sidewalk be steeper than 2:1. The grade of meandering sidewalks shall be shown on the profile as a condition for approval by the City of Sisters.

Safety is a primary design consideration. All portions of the sidewalk shall be visible from the street. Trees and brush shall be thinned or removed to provide the required visibility.

Meandering sidewalks shall cross intersections no further back than the center of the curb radius or where bulb-outs are located at the end of the curb radius. Accessible ramps meeting the standards of ADA shall be provided.

The landscape strip so created shall not be less than 36" wide, except where the sidewalk meander returns to be adjacent to the curb. To prevent sharp re-entrant angles in the landscape strip, an edge not less than 8" long and squared to the curb shall be constructed at the juncture of the sidewalk to the curb. Provision shall be made for landscaping the landscape strip. Provision shall be made, and facilities installed for the irrigation of the landscape strip.

215.2.00 MATERIALS

215.2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the requirements of Section 213.2.01.

215.2.02 COLORED PORTLAND CEMENT CONCRETE-DOWNTOWN SIDEWALKS

Portland cement concrete shall conform to the requirements of Section 213.2.01 and the following: color shall be determined by the Public Works Director in consultation with the Development Code. Color shall be mixed integrally with the concrete.

215.2.03 INTERLOCKING PAVER SIDEWALKS

Furnish permeable interlocking concrete pavers including base preparation, rat slab substrate construction, and joint sand. The rat slab is defined as a 4" concrete leveling substrate to prevent settling of the pavers. Contractor shall comply with ASTM C 936, Standard Specification for Solid Concrete Interlocking Paver Units, as incorporated by reference.

Interlocking concrete pavers shall be hydraulically pressed concrete, configured for interlocking with adjacent units and complying with ASTM C 936, and having the following characteristics:

- **Compressive Strength** – 8,000 psi average, with minimum of 7,200 psi.
- **Absorption** - 5 percent average, with maximum of 7 percent.
- **Thickness** – 3 – 1/8 inches
- **Style** – Square, 8" x 8"
- **Color** – Selected from manufacturer's full range
- **Sand for Joints** – Fine washed 1/4" – 10 sand

The design is based on the following product: Eco-Prioria as manufactured by Mutual Materials.

215.2.04 AGGREGATE BASE

215.2.04A Portland Cement Concrete

Portland Cement Concrete Base aggregates for PCC driveways and approaches, including but not limited to materials for base, foundation courses, leveling courses, or bedding shall meet the requirements of Section 207. If a designated size is not shown or given, furnish either 1" - 0 or 3/4" - 0, as the Contractor elects.

215.2.04B Colored Portland Cement Concrete and Interlocking Pavers

Base aggregates for downtown sidewalks including colored Portland Cement Concrete and interlocking pavers shall be 1"-0 in accordance with Section 207.

215.3.00 CONSTRUCTION

215.3.01 PREPARATION OF SUBBASE AND BASE

Preparation of subbase and base shall conform to the requirements of Section 214.3.01.

215.3.02 PLACING, FINISHING, AND CURING PORTLAND CEMENT CONCRETE

This work shall conform to the requirements of Section 213.3.03.

215.3.03 CURB RAMPS

The Contractor shall construct accessible ramps at the locations shown on the plans and in accordance with the details shown on the plans and in conformance with all ADA requirements. Accessible curb ramps shall meet PROWAG standards in all respects. Prior to pouring curb ramps, confirm that forms are constructed to dimensions and grades shown on plans and that grades and dimensions meet PROWAG criteria. Use a digital level to verify that formwork matches plan and PROWAG grades. Correct all discrepancies before pouring concrete to ensure that finished concrete work meets requirements of PROWAG.

215.3.04 EXPANSION JOINTS

Expansion joints shall be constructed at each point of tangency, at connections to existing curbs, driveways, sidewalks, and pathways, around objects which protrude through, into, or about the sidewalk and at spacings not to exceed 25'.

215.3.05 CONTROL JOINTS

Control joints in sidewalks are required at 5' intervals. Control joints shall be scored in wet concrete a minimum of 1/3 the depth of the concrete section.

215.3.06 INTERLOCKING PAVERS

Furnish permeable interlocking concrete pavers including base preparation, concrete rat slab substrate base construction, and joint sand. The rat slab is defined as a 4" concrete leveling substrate base to prevent settling of the pavers. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this Section. Verify that gradients and elevations of substrate are correct.

Work shall include the following:

- Spread crushed rock evenly over prepared subgrade surface to a maximum thickness of 4-6 inch. Dampen and roller compact crushed rock to level and even surface.
- Place and joint and cure concrete base as shown in the Paver Sidewalk Standard Detail.
- Place paver units in straight pattern, from straight reference edge.
- Fill openings and joints with specified joint sand. Remove excess sand by sweeping pavers clean.

- Compact paver units using a vibrating mechanical tamper to compact. Apply additional joint sand to the open joints, filling them completely. Complete a minimum two passes over the paver area.

After sweeping the surface clean, check final elevations for conformance and reset as necessary. The following quality control checks shall be performed:

- The surface tolerance of the compacted surface shall not deviate more than plus/minus 1/4 inch over a 12 ft. straight edge.
- Lippage: No greater than 1/8-inch difference in height between adjacent pavers.
- The surface elevation of pavers shall be 1/8 inch above adjacent concrete walks and curbs.

215.4.00 MEASUREMENT AND PAYMENT

215.4.01 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, sidewalks and pathways shall be considered incidental work for which no separate payment will be made.

215.4.02 SIDEWALKS

Sidewalks shall be measured on a square foot basis to the nearest whole square foot. Payment for sidewalks shall be at the unit price bid at the thickness and measurement unit specified.

215.4.03 PATHWAYS

Pathways shall be measured on a square foot basis to the nearest whole square foot. Payment for pathways shall be at the unit price bid at the thickness and measurement unit specified.

215.4.04 INTERLOCKING PAVER SIDEWALKS

Interlocking paver sidewalks shall be measured on a square foot basis to the nearest whole square foot. The required construction elements including but not limited to base, concrete rat slab and joint sand are considered incidental work for which no separate payment will be made.

216 ADJUSTMENT OF INCIDENTAL STRUCTURES TO GRADE

216.1.00 DESCRIPTION

This work consists of locating, adjusting, leveling, adding to as necessary, and finish paving around water valve boxes, utility vaults, and adjusting the manholes indicated on the plans so that the frame matches the finished pavement grade.

216.3.00 CONSTRUCTION

The manhole frames shall be adjusted with precast grade rings to a maximum of 12 inches. For height extensions greater than 12 inches, the interior diameter of the manhole shall be adjusted as required with precast sections.

Excavated areas around the structure shall not be less than 3' in width. Backfill shall conform to the requirements for Trench Excavation and Backfill. Where the true adjustment is less than 12", but the manhole barrel must be adjusted to conform to this specification, the adjustment shall be considered as greater than 12".

216.4.00 MEASUREMENT AND PAYMENT

216.4.01 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, adjusting incidental structures to grade shall be considered incidental work for which no separate payment will be made.

216.4.02 UNIT PRICE BASIS

Measurement for adjusting incidental structures to grade will be made on a per each basis for the class specified in the Schedule of Bid Items. Payment will be for the actual number of structures adjusted to grade as specified.

217 SIGNING AND STRIPING

217.1.00 DESCRIPTION

This work consists of providing painted striping, pavement markers or signs as shown on the plans and detailed in the standard drawings.

217.2.00 MATERIALS

217.2.01 PAINTED PAVEMENT STRIPING

Materials shall conform to Oregon Standard Specifications for Construction Section 00860.

217.2.01 PAVEMENT MARKINGS

217.2.01A MARKINGS

This Specification describes the minimum acceptable design requirements for furnishing permanent preformed thermoplastic pavement markings, hereinafter referred to as pavement markings, for use as roadway and intersection delineation including crosswalk, stop bar, directional and other roadway markings required by the City. The pavement markings shall consist of preformed letters, numbers, legends, bars, lines, and symbols. Pavement markings shall be of standard skid resistance with no pavement pre-heating requirements prior to installation.

The following specifications shall form a part of this specification as referenced herein. All specifications referenced shall be of the most current revisions:

- AASHTO M 247, Type 1
- AASHTO M 249
- Federal Test Standard Number 595A – Color #17778, Highway White
- Federal Test Standard Number 595A – Color #13538, Highway Yellow
- ASTM E 303
- ASTM C 666

207.2.01B COMPOSITION

1. The pavement markings are to conform to the specifications to be a resilient white or yellow thermoplastic product will uniformly distributed glass beads throughout the entire cross-sectional area. Lines, legends, and symbols shall be capable of being affixed to hot mix or open graded friction asphaltic concrete and Portland cement concrete pavements by the use of normal heat from a propane type torch.
2. The pavement markings shall conform to pavement contours, breaks, faults, and shall be capable of remaining in place without being displaced by vehicular traffic.
3. The pavement markings shall have resealing characteristics, such that when heated by a torch will fuse with itself and to previously applied thermoplastic materials.

207.2.01C MATERIALS

1. Materials shall be composed of polymeric materials, pigments, binders, and glass beads, factory produced as a product. The dimensions shall meet the requirements of the most recent edition of the Manual of Uniform Traffic Control Devices. The Thermoplastic material shall conform to the American Association of State Highway Transportation Officials (AASHTO) Standard M 249, with the exception of the relevant differences for the material being supplied in the preformed state.

2. Graded Glass Beads: Graded glass beads shall be clear, transparent, and shall meet the General Requirement of the AASHTO Standard M 247, Type 1. The materials shall contain a minimum of thirty percent (30%) graded glass beads by weight with nor more than twenty percent (20%) of the glass beads to consist of irregular fused spheroids or silica. The index of refraction shall not be less than 1.50.
3. Retroreflectivity: The pavement markings shall upon application exhibit uniform adequate nighttime retroreflectivity. The pavement markings shall have average minimum retroreflectivity of 250 millicandelas for white and 150 minicandelas for yellow as measured by fifteen (15) meter geometry with a handheld retroreflectometer.
4. Skid Resistance: New pavement markings with standard skid resistance shall provide a minimum resistance value of 50 British Pendulum Number, when tested in accordance to ASTM E 303.
5. Colors: All legends shall be white unless otherwise specified. White pavement markings shall contain sufficient titanium dioxide pigment to equal Federal Standard 595A color numbered 17778. Yellow pavement markings shall contain sufficient pigment to equal Federal Standard 595A color numbered 13538. The yellow pigment must be of organic nature only and contain no lead chromate.
6. Material Thickness: Pavement markings minimum thickness shall be 120 mils.
7. Bonding: Pavement markings shall retain a minimum of 65% adhesive bond after 100 cycles of freeze thaw action when tested in accordance to ASTM Standard ASTM C 666.
8. Material Resistance: Pavement marking materials shall be resistant to deterioration due to exposure to sunlight, water, salt, oil, gasoline, or adverse weather conditions.
9. Application: Pavement markings will be applied to clean and dry asphaltic concrete or Portland cement concrete, using the propane torch method as recommended by the Manufacturer. The pavement marking shall be capable of being applied at a minimum ambient temperature of 32 degrees Fahrenheit and a maximum pavement temperature of 300 degrees Fahrenheit.
10. Primer/sealer shall be supplied by the contractor if the pavement markings pre-installation primer/sealer is required by the Manufacturer.
11. The shelf life of the pavement markings shall be 2 years from the date of manufacture. The thermoplastic must also melt uniformly with no evidence of skins or unmelted particles for this two-year period.

217.2.01 SIGNS

Sign materials shall conform to the Oregon Standard Specifications for Construction Section 00940 if not specified in the standard drawings except for the Street name signs which are unique to the City of Sisters. Sign posts materials shall conform the Oregon Standard Specifications for Construction Section 00910 if not specified in the standard drawings.

217.3.00 CONSTRUCTION

217.3.01 PAINTED PAVEMENT STRIPING

Installation shall conform to Oregon Standard Specifications for Construction Section 00861. Painted pavement striping is only allowed for center line, bike/fog lines and parking stall striping. Before installing striping, layout must be inspected and approved by City Engineer's representative.

217.3.01 PAVEMENT MARKINGS

Installation shall conform to Oregon Standard Specifications for Construction Section 00850. All cross walk and stop bars shall be installed using thermoplastic pavement markings.

217.3.01 SIGNS

Installation shall conform to City of Sisters Standard Drawings 2-24 to 2-26 or the Oregon Standard Specifications for Construction Section 00905, 00910 and 00940 if not specified in the standard drawings.

217.4.00 MEASUREMENT AND PAYMENT

217.4.01 UNIT PRICE BASIS FOR SIGNS

Measurement for signs will be made on a per each basis for the signs specified in the Schedule of Bid Items. Payment will be for the actual number of signs installed as specified. No separate payment will be made for providing and installing posts.

217.4.02 LUMP SUM BASIS FOR STRIPING AND PAVEMENT MARKINGS

Unless otherwise noted on the plans, striping and pavement markings will be measured and paid for on a lump sum basis.

221 LANDSCAPING

221.1.00 DESCRIPTION

This work consists of furnishing and installing landscaping and irrigation facilities in public rights-of-way, including downtown sidewalks. Except as modified or supplemented herein, the provisions of Sections 01030 and 01040 of the *Oregon Standard Specifications for Construction*, current edition, shall apply.

221.1.01 DOWNTOWN COMMERCIAL AREA

Furnish labor, materials, equipment, and supervision necessary to complete all work shown on the Drawings and in the Specifications.

Protect active utilities encountered and notify persons or owner agencies. Landscape Contractor shall request utility markouts prior to excavating and verify with General Contractor the location of all underground site utilities.

221.1.02 IRRIGATION

Except as modified or supplemented herein, the provisions of Sections 01120 of the *Oregon Standard Specifications for Construction*, current edition, and all supplements shall apply.

Furnish all labor, materials, equipment, and supervision necessary to complete all work shown on the Drawings and as described in the specifications. The Landscape Contractor shall employ and have on site at all times during installation of the system competent individuals knowledgeable about the irrigation products and equipment specified.

Before proceeding with the installation of any section of the irrigation system, Contractor will check and verify the correlation between ground measurements and the drawings. The layout of the irrigation system is schematic. Follow as closely as is practicable. Notify Engineer of changes that have taken place in the field.

Contractor shall have all utilities marked out prior to excavating for irrigation lines. Landscaper shall verify the location of all underground site utilities with General Contractor, and protect all active utilities encountered. Utility owners shall be notified if conflicts occur.

Provide and install sleeves, automatic irrigation system, and valve boxes. Remove existing soil from around existing trees to allow for irrigation heads and new tree grates as detailed. Coordinate installation of sleeves under all hard surfaces with General Contractor.

Points of Connections (P.O.C.) for the irrigation system and valve boxes shall be provided and installed by the Contractor in conformance with the Water Service and Meter Installation Manual. Meters will be provided and installed by the City of Sisters Public Works Department Water.

Protection of Unfinished Work: Provide protection at all times to keep rock, dirt, gravel, debris and all other foreign materials from entering piping, valves, and other irrigation equipment.

Environmental Conditions: Solvent welding of PVC pipe shall be performed under cover during rainy weather and is not allowed in freezing conditions.

Storage: PVC pipe and fittings shall not be stored or left out in direct sunlight.

Guarantee and Replacement: Contractor shall guaranty the irrigation system, or any part thereof, against defects in materials and workmanship for a period of one year from the date of acceptance by the City. Any defects appearing during the warranty period shall be repaired or replaced without additional expense to the City of Sisters. Any apparent settling of backfilled trenches occurring during the warranty period shall be properly filled and re-graded, including repair and complete restoration of all damaged planting, paving, or other improvements of any kind.

221.2.00 MATERIALS

221.2.01 DOWNTOWN COMMERCIAL AREA

221.2.02A General - Materials shall be as shown on the Drawings and specified herein.

221.2.02B Topsoil - Clean, friable, natural sandy loam material, free of debris, roots, stones, weeds and grass.

221.2.02C Textural Soil Amendments - Garden Care Compost, as provided by North American Soils, Inc., Portland, Oregon 97203. Five (5) Cubic Yards required for each 9 trees to be planted.

221.2.02D Tree Grates - Tree grate specifications will be provided by the City of Sisters. Contractor shall provide and install the tree grates according to city approved specifications.

221.2.02E Trees - Trees will be minimum 2" caliber to be measured 6" from graft and an approved tree type. The City will approve tree type and location before ordering.

221.2.02 IRRIGATION

Furnish only commercial quality materials and equipment, new and of brands and types shown on Drawings and as specified herein. All items proposed for use will be subject to testing to assure compliance with the Specifications. Provide materials for the same or related function that are of the same type and manufacturer.

221.2.03A IRRIGATION EMITTERS

Techline CV' 17 mm Dripline as manufactured by Netafim USA

221.2.03B PIPE, FITTINGS and TUBING

- (1) **PVC Pipe (Polyvinylchloride)** PVC 1120, Type 1, normal impact, I.P.S., NSF approved; plain and/or bell end; conforming to ASTM D1784-69 and D2241-73, color white. Sleeves under paved areas shall be Schedule 40 PVC with minimum 2-inch inside diameter.
- (2) **PVC Pipe Fittings** PVC 1120, Schedule 40, Type 1, normal impact, I.P.S., NSF approved, meeting requirements of ASTM tentative specifications D-2466 and D-1784.
- (3) **PVC Riser** PVC 1120, Type 1, normal impact, I.P.S., NSF approved schedule 80 PVC, conform to PS 21-70. Cut to required lengths threaded both ends, color: dark grey.
- (4) **Irrigation Tubing** Rain Tube - low density polyethylene, manufactured under the strictest ASTM - RB - 1049.
- (5) **Emitter distributing Tubing** Techline CV' 17mm Dripline, as manufactured by Netafim USA.

221.2.03C PVC SOLVENTS:

- (1) **PVC Solvent Cement** NSF approved solvent for PVC through 4", meeting requirements of ASTM D-2564, #705.
- (2) **PVC Primer and Cleaner** Weld-On P-70

221.2.03D BACKFLOW DEVICES Refer to City of Sisters Water Service and Meter Installation Manual. C.O.R. Water Division will determine the final choice for backflow devices.

221.2.03E VALVES and VALVE BOXES:

- (1) **Automatic Control Valve** - 1" - 24-volt Irri: -Rainbird solenoid valves.
- (2) **Quick-Coupling Valve** - One-piece, double slot 1" I.P.S. with vinyl cover and lock top. Rain Bird No. 5 LVC.
- (3) **Valve Box** - Jumbo boxes, Traffic rated where exposed to vehicular traffic.

221.2.03F CONTROLLERS and ELECTRICAL:

- (1) **Controller** - Rainbird ESP-8LXME' automatic irrigation controller
- (2) **Control Wire** - Type UF bearing U/L approval for direct underground burial in National Electric Code Class II circuits. AWG sizes, minimum size #16.

221.2.03G GRAVEL 3/4" x 1/2" clean, washed, round gravel.

221.2.03H ACCESSORIES

- (1) **Quick-Coupling Valve Coupler** - Rain Bird No. 55 K-1.
- (2) **Hose Swivel** - Rain Bird No. SH-2.

221.3.00 CONSTRUCTION

221.3.01 DOWNTOWN COMMERCIAL AREAS

221.3.013A General - Remove from all planting openings, stones, mortar, concrete, asphalt, rubbish, debris, and any other materials considered harmful to plant life.

221.3.01B Soil Preparation - Thoroughly mix together 3.0 cubic yards of topsoil and 6 inches textural soil amendment at each proposed tree location.

221.3.01C Tree Grates - Tree grates to be installed after the irrigation and topsoil placement has been completed. Verify tree grate installations with General Contractor.

221.3.02 IRRIGATION

221.3.02A GENERAL

Installation of all materials and equipment will be in accordance with the manufacturer's written instructions and recommendations, and all applicable local and State of Oregon requirements.

221.3.02B EXCAVATION AND BACKFILL

(1) **Trenches** Pipe trenches shall be straight or 'snaked' slightly allowing for expansion and contraction of PVC pipe.

- (a) **Grades** - Bottoms of uniform slopes 1% minimum grade, except 1/2% minimum where greater slope is not practicable.
- (b) **Trench Depth** - 12" minimum pipe cover.
- (c) **Trench Width** - Provide sufficient width at bottom of trench to allow for proper tamping around pipe.
- (d) **Preliminary Backfill** - Backfill any excess excavation with suitable material free of rocks, sticks, or other material that may damage pipe, and thoroughly compact to give full support to the pipe.
- (e) **Bell Holes** - Provide bell holes to provide support of pipe over its entire length.

(f) Bottom of Trench - Bottom of trenches will be smooth and free of sharp rock and other objects that may damage pipe.

(g) Finish Grade Backfill - Backfill trenches to subgrade, place backfill carefully around and over piping, removing rocks, or other material that may damage pipe; wet and tamp earth in layers not over 6" thick until thoroughly compacted.

(2) Installation

(a) Control Valves - Install control valves, and quick-coupling valves as indicated on Drawings. Verify exact locations in the field with Engineer prior to installation.

(b) Valve Boxes - Install perpendicular/square with building wall, curb or sidewalk for neat uniform appearance.

(c) Emitters - Install emitters at locations shown on Drawings.

(3) Pipe

(a) Install pipe in accordance with standard practice, supported at all points and "snaked" slightly allowing for expansion and contraction.

(b) PVC pipe joints shall be solvent welded except as indicated. Cut pipe square, deburr, wipe from the surface all saw chips, dust, dirt, moisture, and all foreign matter which may contaminate the cemented joint. Apply primer and solvent cement. Make all joints in accordance with manufacturer's recommendations.

(c) Provide a leak-resistance, water-tight joint with freedom of movement at all swing and/or swivel joints.

(4) Control Wiring

(a) Lay in trench under mainline for maximum protection.

(b) Place in conduit and pipe sleeves where indicated.

(c) Single wires (red) to each solenoid from control and a common neutral wire (white) to all solenoids from the controller.

(d) For wire sizes, use wire sizing chart published by manufacturers of battery control valves installed.

(e) No wire splices are permitted.

(5) Automatic Controllers Install as indicated on Drawings.

(6) Flushing and Testing

(a) Mainline Flushing - Flush mainline before installing emitters.

(b) Mainline Testing - Test mainline piping, valves, joints, and fittings for not less than two (2) hours before inspection prior to backfilling. Minimum test pressure will be pre-set by pressure regulator for two hours, with no greater pressure loss than 5 psi.

(c) Defects - Immediately correct any and all leaks or defects found and re-test.

(d) Double-Check Valve Test - Have State Health Department approved double-check valve tested by local State Certified Tester before start up. Have double-check valve tested again at the end of guarantee period. Submit copy of Test Report to Engineer after each test is completed.

(7) Adjusting and Balancing Adjust and balance irrigation system to provide uniform coverage.

(8) Clean Up Keep premises reasonably free from accumulation of debris. On completion of each division of work, remove all debris, equipment, and surplus materials and leave the premises clean.

(9) Maintenance During the first-year guarantee period, shut down and winterize system no later than November 1st. Activate system in spring, no later than April 15th. and balance for coverage. (Shut-down and turn-on is based on weather condition-use best judgment. Notify Engineer of changes due to weather conditions.) Provide the City of Sisters before final payment with "Record Drawings" of irrigation system showing drain valve locations and other revisions, including product information on all materials used. Three copies of product information are required.

(10) Backflow Device Test Report Submit to Public Works Department.

221.4.00 MEASUREMENT AND PAYMENT

221.4.01 DOWNTOWN COMMERCIAL AREA

Payment will be made at the price bid per unit of measurement for each of the items that appear in the proposal. Payment shall be understood to be full and complete compensation for all materials, labor, equipment, tools and incidentals necessary to complete the work as specified in this section.

221.4.02 IRRIGATION

There will be no separate measurement of work done under this section.

Payment will be made at the Contract lump sum amount for the pay item "Irrigation System". The lump sum amount will be considered payment in full for furnishing and placing all piping and fittings, controllers, valves, emitters and sprinklers, and incidentals, leakage testing, and all other work as shown and specified, including excavation, bedding and backfill, electrical service and system orientation.

When not listed in the proposal as a separate pay item, irrigation systems shall be considered incidental to work for Landscaping, and no additional payments will be made.

