DIVISION 2 -GENERAL TECHNICAL REQUIREMENTS

201 MOBILIZATION

201.1.00 DESCRIPTION

This section covers, but is not limited to, work necessary to obtain all bonds, insurance, licenses and permits; move in personnel and equipment; set up all offices, buildings, and facilities; provide all required light, power and water; construct project information signs if required; prepare for construction; demobilize including removal of all facilities and clean up; and all other work to successfully complete the project, which is not covered in other bid items.

201.2.00 MATERIALS

Provide all materials required to accomplish the work as specified.

201.3.00 CONSTRUCTION

201.3.01 GENERAL

Set up construction facilities in a neat and orderly manner within designated or approved work area. Supply all labor and equipment necessary to accomplish the work as specified. Conform to applicable requirements of Section 105 of GENERAL CONDITIONS, including, but not limited to, (1) required notifications, (2) protection of surveying monuments and other markers, (3) temporary traffic control, (4) temporary utility connections, (5) protection of property, and (6) dust control.

201.4.00 MEASUREMENT AND PAYMENT

201.4.01 LUMP SUM BASIS

When listed in the Bid as a separate pay item, payment for Mobilization will be made on a lump sum basis.

Amounts to be allowed for Mobilization in the partial payment to be made under the Contract will be as follows:

1. When 5% of the total original contract amount is earned from other bid items, not including advances on materials, 50% of the amount bid for mobilization, or 5% of the total original contract amount, whichever is the least, less normal retainage, will be paid.

2. When 10% of the total original contract amount is earned from other bid items, not including advances on materials, 100% of the amount bid for mobilization, or 10% 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 bid for mobilization in excess of 10% of the total original contract amount will be paid.

The above schedule of progress payments for mobilization shall not limit or preclude progress payments otherwise provided by the contract.

201.4.02 INCIDENTAL BASIS

When not listed in the Bid, all Mobilization costs will be considered incidental work for which no separate payment will be made.

202 TEMPORARY TRAFFIC CONTROL

202.1.00 DESCRIPTION

This section covers all work necessary to conduct construction operations so as to cause the least possible obstruction and inconvenience to the Public and to protect pedestrian and vehicular traffic.

202.2.00 MATERIALS

202.2.01 UNIFORM TRAFFIC, CONTROL DEVICES

Provide traffic control devices, in conformance with the current edition of the Manual on Uniform Traffic Control Devices (MUTCD), as published by the U.S. Department of Transportation -Federal highway Administration; the Oregon Supplements to the MUTCD as published by the State of Oregon Department of Transportation; and as approved by the Owner's Representative through the Traffic Control Plan. Copies of the MUTCD are available at the United States Government BookStore, 1304 SW 1st Avenue, Portland, Oregon.

202.2.02 TRAFFIC CONTROL PLAN

202.2.02A GENERAL

Submit a Work Zone Traffic Control Plan (hereafter referred to as the "Plan") to the Owner's Representative for approval at least 10 working days prior to commencement of construction within the roadway; except if construction is within a State of Oregon roadway, then the Plan shall be submitted at least 15 working days prior to commencement of construction within the roadway.

202.2.02B PLAN REQUIREMENTS

The plan shall address all modes of transportation, including vehicles, bicycles, pedestrians, transit, and adjacent property access.

The base map shall be drawn to scale and show all pertinent roadway features (such as lane widths, curb lines, driveways, etc.) and all existing traffic and parking controls (signs, signals, striping, markings). The Plan shall conform to the Manual of Traffic Control devices (MUTCD), and the Oregon Supplements.

The Plan shall indicate the size, shape, color, location, and type of mounting of all proposed temporary lighting, signs, cones, and barricades. The Plan shall also indicate any existing signing that conflicts with the Plan and shall call out the method to be used to cover the conflicting signs.

The Plan shall indicate the configuration, color, material and location of all proposed temporary pavement markings. The Plan shall also indicate any existing pavement markings that conflict with the Plan and shall call out the method to be used to remove the conflicting pavement markings.

If more than one work zone configuration is desired, a Plan shall be submitted for each work zone.

Construction shall not commence until the Plan has been approved by the Owner's Representative. The Contractor must keep an approved copy of the Plan on site.

The Owner's Representative has the authority to set a designated haul route for the project. The Plan shall include the haul route if one is designated in the project special specifications.

After construction has begun, proposed adjustments to the Plan shall be submitted by the Contractor to the Owner's Representative for approval prior to implementation of the proposed adjustments.

202.2.02C MINIMUM REQUIREMENTS FOR LABOR AND EQUIPMENT

Labor under these provisions applies particularly to flaggers, all of whom shall be physically and mentally qualified, trained in their duties, efficient and courteous. Each flagger on duty, except uniformed law enforcement officers, shall wear an orange or yellow colored hard hat and an orange colored or fluorescent red-orange or fluorescent yellow-orange colored vest and shall be equipped with a highly visible, reflectorized "Stop-Slow" hand sign conforming to current standards for daylight use; and with illuminated stand area, of high visibility for night use.

When work on the project requires closure of a travel lane resulting in one-way traffic, the Contractor shall have flaggers equipped with two-way radios, whenever, in the opinion of the Owner's Representative, that radios are required.

202.3.00 CONSTRUCTION

202.3.01 GENERAL

Provide, in like new condition, and maintain all traffic control devices in conformance with the MUTCD and the approved plan.

Prior to partially or fully closing any street, conform to Subsection 105.05 NOTIFICATION OF UTILITIES AND AGENCIES FOR EXCAVATION and 105.06 NOTIFICATION OF UTILITIES AND AGENCIES FOR STREET CLOSURE. Include the school district serving the area, and TRI-MET if the street is a TRI-MET transit route.

Prior to closing any curb lanes having a TRI-MET transit stop, notify TRI-MET.

Maintain all existing traffic control devices within the work zone which are not in conflict with the Plan.

Where metal plates are used to cover excavations, ramp up to the metal plate with asphalt to make a smooth transition to the satisfaction of the Owner’s Representative.

Patrol the traffic control areas and reset all disturbed traffic control devices immediately. Remove or cover non-applicable traffic control devices during periods not needed, as approved.

In the event that additional traffic controls are needed for special conditions, as determined by the Owner's Representative, the Contractor shall be responsible for the placement and maintenance of the additional devices.

Storage of material or equipment shall not occur within any travel or turning lane during non-working hours.

If the Contractor fails to immediately provide the necessary flag persons, or to provide, erect, maintain and remove traffic control devices when so ordered, the Owner's Representative may, without further notice to the Contractor, do whatever is necessary to meet the requirements of this section and deduct all of the costs thereof from any payments due or to become due the Contractor.

202.3.02 TRAFFIC CONTROL WITHIN THE PROJECT

Formulate and submit a traffic control plan and a work schedule to minimize the disruption of traffic. Obtain approval of plan and schedule from Owner's Representative before commencing work. Allow traffic to pass through the work with as little inconvenience and delay as possible.

The traffic control plan shall contain a complete signing plan for semi-permanent and portable signs, barricades and other traffic controls, provisions to keep the signs or devices current with the construction activities and the illumination of all detours and obstructions during hours of darkness. Be responsible for furnishing, installing and maintaining all traffic control devices. Maintain these devices at all times including non-working hours.

Notify the Owner's Representative a minimum of five calendar days in advance for any adjustments to existing traffic signals, signs or other traffic control devices.

Maintain the existing traffic control signs, such as STOP, YIELD, KEEP RIGHT, and ONE WAY signs, for the duration of the construction in accordance with (a) and (b) below, unless directed otherwise by the Owner's Representative.

(a) If a permanent sign must be temporarily relocated, the sign shall be adequately mounted, placed as near as possible to the original locations, and remain clearly visible to approaching traffic without creating a traffic hazard as approved by the Owner's Representative.

(b) Damaged, missing or improperly located STOP, YIELD or ONE WAY signs shall be replaced or relocated immediately. The Contractor shall provide manual traffic control from the time at which the problem is noted until the time at which it is corrected.

If the Contractor fails to comply with the provisions above, the Owner's Representative may perform the work in accordance with Section 202.3.01 of the Standard Construction Specifications.

Provide approved access to private properties at all times, except during stages of construction when it is impractical to perform construction and maintain access to private property simultaneously, as determined by the Owner's Representative. When access is to be denied, notify occupants of affected properties at least 24 hours in advance.

When in the judgment of the Owner's Representative, vehicular parking is a hazard to through traffic or to the work, furnish and place NO PARKING signs on any street which is directly involved in the construction work.

202.3.03 CONSTRUCTION AND MAINTENANCE OF DETOURS

Construct and maintain temporary detours for protection of the work and the safe passage of traffic around work area, as approved. Conform to requirements for PUBLIC SAFETY AND CONVENIENCE in section 107.12 of the GENERAL CONDITIONS.

When detours are not available, confine operations to a width which provides for safe passage of traffic. If, in the judgment of the Owner's Representative, one-way piloted traffic is necessary, provide at least two (2) flag persons to control traffic, one flag person being stationed at each end of the roadway being limited to restricted use and furnish a pilot car and driver to lead traffic. At the end of each day leave work in such condition that it can be traveled without damage to the work and without danger to public traffic or provide traffic control as directed by the Owner's Representative.

202.3.04 TEMPORARY STRIPING

General Requirements

Temporary striping shall be as shown on the plans for temporary protection and direction of traffic. All temporary striping shall be maintained to the satisfaction of the Owner's Representative by the Contractor throughout the life of the project.

Striping shall be in advance of traffic use unless otherwise allowed by the Owner's Representative. All striping shall be 4 inches in width, except where shown wider on the plans, and shall be "beaded" with glass beads.

Materials -Striping paint shall conform to AASHTO M 248. Glass beads shall conform to AASHTO M 247.

Construction -When skip striping is required, the interval shall be 15 feet between 9 feet of stripe. The use of approved reflectorized striping tape may be allowed. If used, the tape shall be 4 inches wide by 10 inches long placed and maintained at 15 foot intervals. Any striping not acceptable to the Owner's Representative shall be immediately removed and replaced at the Contractor's expense.

Immediately following the construction of the final wearing surface, the Contractor shall remove all remaining temporary striping, and mark the permanent channelization configuration with an approved striping tape 4 inches wide by 10 inches long placed at 15 foot intervals.

Stripe Removal -All stripe removal shall be done by sandblasting, hydroblasting, or other method approved by the Owner's Representative. Grinding will not be allowed. Stripe removal shall include complete removal of all designated paint and traffic markers and cleaning up of all resulting debris. All removal work shall be coordinated with the construction activity and shall be performed during the same day or days as the traffic shift is accomplished.

202.4.00 MEASUREMENT AND PAYMENT

202.4.01 LUMP SUM BASIS

When listed in the Bid as a separate pay item, payment for Temporary Traffic Control will be made on a lump sum basis.

202.4.02 INCIDENTAL BASIS

When not listed in the Bid for separate payment, all Temporary Traffic Control will be considered incidental work for which no separate payment will be made.

202.4.03 UNIT PRICE BASIS

When listed in the Bid as single items, the accepted quantities will be paid at the contract unit price per unit of measurement for the item.

203 CLEARING AND GRUBBING

203.1.00 DESCRIPTION

This section covers work necessary to clear, remove and dispose of all debris and vegetation such as stumps, trees, logs, roots, shrubs, vines, grass and weeds within the designated limits, to preserve from injury or defacement such objects and vegetation as are designated to remain in place, and to perform final clean-up of the designated area.

Clearing is defined as cutting of trees, bushes, vines and other vegetative growth at or above ground surface and removal from the site of all such cut or down vegetation.

Grubbing is defined as removal of vegetative growth and natural wooden items remaining at or below ground surface following the clearing operation.

Review with the Owner's Representative the location, limits, and methods to be used prior to commencing work under this section.

Removal of man-made structures, including, but not limited to, concrete slabs, walls, vaults, footings, asphaltic surfaced areas, and graveled areas, shall be included in payment for excavation or excavation and backfill as provided in Subsection 204.3.03, and will not be included in Clearing and Grubbing.

As designated in Section 105.10 PROTECTION AND RESTORATION OF PROPERTY, it is the Owner's intent to allow occupants of property adjacent to the work to have the salvage rights to plants, trees, shrubs, fences and other improvements in the right-of-way. Contractor does not assume ownership of clearing and grubbing items until after fulfilling the requirements of Section 105.10 PROTECTION AND RESTORATION OF PROPERTY and Section 203.3.02 TIMBER SALVAGE.

203.2.00 MATERIALS

Explosives used for clearing and/or grubbing shall be fresh, stable material manufactured to the standards of the "Institute of Makers of Explosives", and shall conform to the applicable requirements of ORS Chapters 476 and 480.

203.3.00 CONSTRUCTION

203.3.01 GENERAL

Obtain the required permit from the State Forester as specified in Subsection 105.10 PROTECTION AND RESTORATION OF PROPERTY, and perform clearing work in conformance thereto.

Remove trees and plants as designated within the area of work, and remove all sod, topsoil, and organic earth within designated areas.

Remove and stockpile as directed, all topsoil that is free of roots, rocks, and other objectionable material and is determined by the Owner's Representative to be suitable for future use. Take reasonable care to prevent topsoil from becoming mixed with subsoil. Contractor shall provide imported topsoil per 207.2.04B IMPORTED TOPSOIL at its sole expense if existing topsoil is not adequately segregated as determined by the Owner's Representative.

203.3.02 TIMBER SALVAGE

203.3.02A TREES IN STREET RIGHT-OF-WAY

The adjacent property owner shall have the right to any trees felled in the right-of-way adjacent to owner's property. Contractor shall notify adjacent property owners by mail or doorhanger at least 48 hours prior to felling trees. Adjacent property owners shall have 24 hours after timber is felled to remove timber from right-of-way, after which time ownership of timber shall revert to the Contractor.

203.3.02B TREES ON CITY OWNED PROPERTY

Owner reserves the right to merchantable timber as designated in the Contract Documents and as marked at the project site by the Owner's Representative. Assume ownership, remove, and dispose of all other timber. Cut, trim and handle marked merchantable timber in such a manner as to ensure the best sale value to Owner and dispose of resulting waste materials as hereinafter specified.

203.3.03 CLEARING

Clear the area above the natural ground surface of all vegetation and objectionable materials. Cut timber and timber growth so that no stump extends above ground surface more than 6 inches. Prune all limbs over paved streets to an elevation fourteen feet above the pavement on arterial and collector streets, and eleven feet above the pavement on residential streets. Prune all limbs over sidewalks to an elevation seven feet-six inches above the sidewalk. All such pruning shall be done in accordance with accepted arboricultural standards, and shall be as approved by the Street Tree Division, City of Portland, Bureau of Parks.

203.3.04 CLEARING BORROW AND WASTE DISPOSAL AREAS

Clear areas designated as borrow and waste disposal areas to designated limits and dispose of all waste as herein specified.

203.3.05 GRUBBING

Completely remove all stumps within the limits of required excavations, and within the limits of required embankments.

Use of explosives for stump removal shall conform to requirements of Subsections 204.3.09 ROCK EXCAVATION AND EXPLOSIVES.

On areas to be occupied by embankments, remove all roots and embedded wood to a depth not less than 1 foot below subgrade or slope surface on which the embankment is to be constructed.

On excavation areas, remove all roots and embedded wood to a depth not less than 6 inches below subgrade or slope surface through which excavation is required. Areas on which grubbing is to be performed shall be as specified.

203.3.06 DISPOSAL OF WASTE MATERIAL

Remove and dispose of all waste materials or debris. When burning is permitted by law, pile all trees, stumps, brush, roots, and similar combustible material within the cleared area and dispose of by burning, subject to air quality standards and permits.

Remove all waste material from the site when burning is not permitted, when not combustible, or when not practicable to burn.

203.3.07 BACKFILLING AND CLEAN-UP

In areas not subject to future excavations, fill all holes and depressions caused by clearing and grubbing with material acceptable to the Owner's Representative and reshape area to conform to adjacent undisturbed topography.

On all sewer projects provide seeding, mulching and erosion protection as specified in 105.10 PROTECTION AND RESTORATION OF PROPERTY.

Leave work area in a clean and sightly condition, free from litter and debris.

203.3.08 PROTECTION OF EXISTING TREES

Contractor will provide adequate protection for trees, shrubbery and other vegetation adjacent to the work area which are to remain. No roots projecting into the excavation will be cut except in the presence of the Owner's Representative. All roots authorized to be cut will be cut neatly, with a sharp tool to avoid torn root endings. Remove branches only as directed by the Owner's Representative and treat scars by removing all loose material around wound.

203.4.00 MEASUREMENT AND PAYMENT

203.4.01 ACREAGE BASIS

When shown in the Bid, payment for clearing and grubbing will be made on an acreage basis for the area cleared and grubbed within limits staked by Owner's Representative, measured to the nearest 0.1 acre. No payment will be made for area within the existing street or easement where clearing or grubbing is not required.

203.4.02 LUMP SUM BASIS

When shown in the Bid, payment for clearing and grubbing will be made on a lump sum basis for all clearing and grubbing within the limits specified.

203.4.03 INCIDENTAL BASIS

When not listed in the Bid for separate payment, all clearing and grubbing will be considered incidental work for which no separate payment will be made.

203.4.04 CONTINGENT TREE REMOVAL

Bid items listed as "Contingent Tree Removal" in the Bid, apply to trees noted as "Bid Separately to Remove" or "Save" or "Tree to Remain," or notes of similar intent on the plan sheets. If, after consultation with the Owner's Representative, it is determined that it is necessary to remove any such above-described tree, the "Contingent Tree Removal" bid item shall apply.

204 EXCAVATION, EMBANKMENT, BEDDING, AND BACKFILL

204.1.00 DESCRIPTION

204.1.01 GENERAL

This section covers work necessary for excavation, construction of embankment, foundation stabilization, pipe bedding, pipe zone backfill, trench backfill, structural backfill, and disposal of material required in construction of streets, sewers, water mains, structures, and appurtenances thereto.

204.1.02 UNCLASSIFIED EXCAVATION

Unclassified excavation is defined as all excavation, regardless of type, nature or condition of materials encountered. Assume full responsibility to estimate the kind and extent of various materials to be encountered in order to accomplish the work.

204.1.03 CLASSIFIED EXCAVATION

204.1.03A ROCK EXCAVATION

Rock Excavation is defined as the removal of all material which by actual demonstration cannot, in Owner's Representative's judgment, be reasonably excavated with equipment comparable to types listed in TABLE 1 and equipped with rippers or similar approved equipment and which is, in fact, systematically drilled and blasted or broken by power-operated tools designed for rock excavation. Owner's Representative may waive the demonstration if material encountered is well-defined rock. The term Rock Excavation shall be understood to indicate a method of removal and not a geological formation.

TABLE 1		
Manufacturer	Model	Type of Excavation
Caterpillar	225	Trench
John Deere	690	Trench
Case	980B	Trench
Caterpillar	D8	Grading and Structural

In trenches, boulders or pieces of concrete below grade larger than 1/2 cubic yard will be classified as rock if drilling and blasting or other approved methods are actually used for their removal from the trench. If material which would be classified as rock by the above definition is mechanically removed without blasting, breaking or splitting, it will be considered common excavation and will be paid for as such at the unit price bid, except if larger equipment is brought in for the sole purpose of rock removal, as defined above, then such removal will be considered rock excavation and will be paid for as such at the unit price bid.

204.1.03B COMMON EXCAVATION

Common excavation is defined as removal of all material not classified as Rock Excavation or Concrete Excavation.

204.1.03C CONCRETE EXCAVATION

Concrete Excavation is defined as the removal of all material composed of Portland cement, with or without reinforcement, that has not been identified in another Bid Item.

204.1.04 TRENCH EXCAVATION

Trench Excavation is defined as removal of all material encountered in the trench to the depths and widths as shown or as directed, and is classified as either Common, Concrete or Rock Excavation.

204.1.05 BORROW EXCAVATION

Borrow material is defined as material obtained from borrow sources lying outside of, separated from, and independent of planned excavation occurring within the project limits.

204.1.06 EMBANKMENT

Embankment is defined as material placed and compacted to the depth and configuration as shown on the plans.

204.1.07 FOUNDATION STABILIZATION

Foundation Stabilization is defined as the removal of unsuitable material in the bottom of an excavation and replacement with specified material for support of a roadbed, pipe, main, conduit, structure, or appurtenances.

204.1.08 PIPE BEDDING

Pipe Bedding is defined as furnishing and placing of suitable material under and around the pipe in accordance with the appropriate Standard Plan.

204.1.09 PIPE ZONE

Pipe Zone is defined as the full width of trench from the bottom of bedding to a point 12 inches above top outside surface of the barrel of pipe as shown on the appropriate Standard Plan.

204.1.10 TRENCH BACKFILL

Trench Backfill is defined as furnishing, placing, and compacting backfill material in the trench between the top of pipe zone and bottom of aggregate base, ground surface, or as directed. Trench backfill shall be classified as either Native Backfill Material (See 204.2.05) or Imported Granular Backfill Material (See 204.2.06).

Native backfill shall not be used for trenches within the public right-of-way unless pre-approved by the City Engineer prior to permitting or beginning of excavation.

Controlled Low Strength Material (CLSM) shall be used as backfill, to subgrade, on all trenches 12" or less in width within public right-of-way. CLSM cannot be used as a replacement course for paved sections, unless a pavement section design is submitted and approved by the City Engineer. The CLSM must comply with the specifications outlined in 204.2.06D - CONTROLLED LOW STRENGTH MATERIAL (CLSM) FOR NARROW TRENCH APPLICATIONS.

When excavation exposes existing metal pipes, adequate protection must be provided to separate the pipe from direct contact with the CLSM. Any metallic pipe must be protected by one of the following methods:

1. Re-establish the initial pipe zone bedding and backfill around the subject utility;
2. Alternately, at the direction of the utility owner, provide pipe protection, such as pipe coating, tape wrap or casing, according to the subject utility's requirements.

204.1.11 SEWERS, PIPES AND MAINS

Sewers, pipes and mains are defined as conduits of circular and other geometric shapes, used to convey liquids or gases, or other material.

204.1.12 COMPACTION AND DENSITY MEASUREMENT

In-place density of soil and aggregate will be determined in accordance with D2922-01 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) and D3017-01 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

204.1.13 MAXIMUM LABORATORY DENSITY AND OPTIMUM MOISTURE CONTENT DETERMINATION

Maximum laboratory density and optimum moisture content will be determined in accordance with ASTM D 698 (Standard Proctor) or ASTM D 1557 (Modified Proctor) with coarse particle correction made in accordance with, and to the limits defined in AASHTO T224.

204.2.00 MATERIALS

204.2.01 BORROW AND EMBANKMENT MATERIALS

Provide borrow and embankment materials of approved earth, sand, bank-run or river-run gravel or rock, or combinations thereof, as specified or directed, free of peat, humus, muck, frozen ground, organic matter or other materials detrimental to construction of firm, dense, and sound embankments.

Use all approved materials originating from required excavations as far as practicable in the formation of embankments and subgrade, and for backfilling and other work as shown on Plans or directed. Maximum particle size shall be as shown on Plans or approved.

204.2.02 FOUNDATION STABILIZATION

Use foundation stabilization consisting of 6" -3/4" gravel or crushed aggregate, or as directed by the Owner's Representative. The material will be free from excessive clay or organic material and will be well graded from coarse to fine, or open graded, as specified or directed by the Owner's Representative.

204.2.03 PIPE BEDDING

204.2.03A RIGID SEWER PIPE

Use 3/4" -0" or 1" -0" crushed aggregate or Portland cement concrete as shown on the appropriate Standard Plan or construction Plans.

204.2.03B FLEXIBLE SEWER PIPE

Use pipe bedding material as specified.

204.2.03C WATER PIPE

Use bedding material consisting of imported 3/4 "-0 " or 1/4"-0" crushed aggregate conforming to Section 303 AGGREGATE BASES or Sand conforming to Subsection 204.2.06A SAND. Native sand bedding material may be used, as specified in Subsection 204.3.17C BEDDING FOR WATER PIPE, if approved by the Owner's Representative.

In addition to the requirements listed above, the resistivity of the fine portion of bedding materials must exceed 5,000 ohm-centimeters when tested in accordance with the following parameters:

1. Samples shall be passed through a US No. 30 sieve (0.6 mm) and wetted to a paste consistency that approximates a saturated condition.

2. Measurements shall be made with an AC soil resistance meter, Nillson 400 or equal, and a soil box mC Miller 4-pin, Agra 2-pin or equal.

3. Results shall be based on either 4 samples whose minimum resistivity exceeds 5,000 ohm-centimeters or the probability the 90% of the material has a resistivity greater than 5,000 ohm-centimeters based on a log probability plot of a minimum of 4 ranked samples with the ranked percentiles as rank/number+1.

204.2.04 PIPE ZONE BACKFILL

204.2.04A SEWER PIPE

Use pipe zone backfill material above the bedding consisting of selected trench side material which is friable and free of vegetation, containing no frozen ground, rock, clay masses, clods, or other pieces of material larger than 1 inch. Use imported granular backfill material when specified or directed.

204.2.04B WATER PIPE

For pipe zone backfill use granular material, as specified in Subsection 204.2.03C PIPE BEDDING, for bedding material.

The Engineer may approve native excavated granular material for bedding if the Contractor screens out particles larger than 1/4 inch if used around coal tar coated steel pipe or larger than 3/4 inch for use with concrete cylinder pipe or with ductile iron pipe. Also, remove fines that will pass a No. 200 screen. If native material is approved, submit proposed screening method to Owner's Representative for approval, which must be obtained prior to start of this work.

204.2.05 NATIVE BACKFILL MATERIAL

Use approved native material excavated from within limits of the project, free from vegetation and other deleterious material, and containing no frozen ground. Maximum particle size shall be as shown or approved, except for trench backfill, wherein the particle size shall not exceed 1/2 cubic foot in volume.

If the Owner's Representative determines native material is not suitable, use imported backfill, Subsection 204.2.06 IMPORTED GRANULAR BACKFILL MATERIAL.

204.2.06 IMPORTED GRANULAR BACKFILL MATERIAL

Use imported material for backfill consisting of sand bank-run or river-ran gravel from an approved source, or crushed aggregate, or as directed by the Owner's Representative.

204.2.06A SAND

1. Use sand consisting of fine granular material, naturally produced by the disintegration of rock, or produced from crushed gravel, and reasonably free of organic material, mica, clay and other deleterious substances.

2. Use dredge sand produced from river dredging and reasonably free of organic material, mica, clay, and other deleterious substances.

The grading of sand used for backfill shall be as follows, or as approved by the Owner's Representative:

Percentage Passing by Weight		
Sieve Size	Coarse Sand	Fine Sand
1”	100	100
3/8”	95-100	---
#4	80-100	90-100
#30	10-30	---
#100	---	2-10
#200	0-8	0-4
Sand Equivalent	50 min.	50 min.

3. When using sand as imported granular trench backfill material, material must be-able to stand on a minimum 60 degree angle from horizontal following compaction to specified density unless otherwise approved by the Owner's Representative. Specified density will be a minimum of 95% of Standard Proctor maximum density.

204.2.06B BANK-RUN AND RIVER-RUN GRAVEL

Use bank-run or river-run gravel from an approved source, free from organic material, having a maximum aggregate size of 3" (1 inch in pipe zone) and being well graded according to requirements of ASTM D 2487, or as approved by the Owner's Representative.

204.2.06C CRUSHED AGGREGATE

Use crushed aggregate consisting of graded crushed gravel or crushed rock, free from organic material, with maximum particle size as shown or approved and conforming to requirements for aggregate base material in Section 303 AGGREGATE BASES.

For trench backfill, the maximum particle size shall not exceed 3 inches, (1 inch in pipe zone).

204.2.06D CONTROLLED LOW STRENGHT MATERIAL (CLSM) FOR NARROW TRENCH APPLICATIONS

A "narrow trench" for this specification applies to all trenches 12" or less in width within the public right-of-way.

A. Controlled Low Strength Material (CLSM) is a low strength, flowable mixture of Portland cement, fly ash, aggregates, water and admixtures, if necessary, used for backfilling trenches. When cured the CLSM produces a hard, dense, non-settling material that is hand-excavatable.

B. The CLSM must be flowable (free-flowing), non-segregating, cohesive, self-consolidating, and excavatable. The desired flowability shall be a minimum 5” spread using ASTM D 6103 standard test method.

C. CLSM shall be mixed in accordance with paragraph 602.3.05 MIXING of the Standard Construction Specifications. Materials used shall conform to the following Standard Specifications:

Material	Standard Specification
Coarse Aggregates	Section 205.2.12B COARSE AGGREGATES
Fine Aggregates	Section 205.2.12C FINE AGGREGATES
Water	Section 205.2.11 WATER
Fly Ash	AASHTO M85 Class F
Cement	Section 205.2.10 PORTLAND CEMENT

Alternative aggregate materials like native soils with more than 10% passing a #200 sieve, and quarry waste products can be considered as an aggregate source. Soils with clay or plastic fines shall not be allowed.

A minimum of sixty percent (60%) of the total aggregates by weight shall pass the #8 sieve. The maximum size aggregate for narrow trenches shall be 3/8”.

D. Placed CLSM shall be designed to achieve a 72-hour strength of 10-pounds/square inch (psi) and support vehicular traffic without rutting. CLSM strength shall be verified with an approved method prior to placement of any base rock or asphalt. At 28-days the maximum unconfined compressive strength of the CLSM shall be less than 100 psi and after 2-years the maximum unconfined compressive strength shall be less than 200 psi.

E. The top of the CLSM trench backfill material shall coincide with the bottom of the pavement subgrade elevation within public rights-of-way. No compaction of CLSM will be allowed. Uncured CLSM shall be steel-plated and protected from traffic until the required 72-hour strength is achieved.

F. Measurement and Payment for CLSM will be made on a cubic yard basis only when listed in the bid as a separate item in the Contract. Volume shall be measured in the same manner as set forth in paragraph 204.4.07C GRANULAR TRENCH BACKFILL MATERIAL FOR SEWER PIPE.

G. A Conditionally Approved List of suppliers and mix designs is available from the City's Materials Testing Lab. Any requests to use other suppliers or designs shall be submitted in writing to the City for review and approval prior to any excavation beginning in the field.

204.2.07 IMPERVIOUS BACKFILL

Utilize impervious backfill material of the following soil types as defined by ASTM D 2487; SC, GC, CL, and approved by the Owner's Representative.

204.2.08 IMPORTED TOPSOIL

Conform to imported topsoil in Section 207 LANDSCAPING.

204.2.09 NATIVE TOPSOIL

Use approved topsoil from the site, properly stored and protected and free from grass, overburden and roots, sticks, hard clay, and any stones which will not pass a 1 inch square opening.

204.2.10 WATER FOR COMPACTION

Use water which conforms to requirements of Section 205 MATERIALS - TYPES AND USE. Provide water at no additional expense to Owner.

204.2.11 EXPLOSIVES

Use explosives which are fresh, stable materials manufactured to the standards of the "Institute of Makers of Explosives", and conforming to applicable requirements of ORS Chapters 476 and 480.

204.3.00 CONSTRUCTION

204.3.01 EXCAVATION

Excavate, remove and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions, encountered within limits defined or as specified in the Contract Documents, necessary for construction of the project.

Incidental to excavation shall be the furnishing, installing and removal of all shoring, sheeting and bracing required to support adjacent earth banks and structures, and for the safety of the public and of all personnel working in excavation.

204.3.02 PRESERVATION OF EXISTING IMPROVEMENTS

Conduct operations in such a manner that existing street facilities, utilities, railroad tracks, structures, and other facilities, which are to remain in place will not be damaged, as specified in Section 105 CONTROL OF WORK Furnish and install cribbing and shoring or whatever means necessary to support material around existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed, at no expense to Owner.

Protect temporary facilities, until they are no longer required, and when temporary supports and other protective means are no longer required, remove and dispose of as directed by Owner's Representative.

204.3.03 EXCAVATION OF EXISTING IMPROVEMENTS AND MISCELLANEOUS

Unless otherwise specifically provided, excavation or excavation and backfill includes all excavating, removing, hauling and depositing, including but not limited to existing pavements, walks, driveways, surfacings, slabs, curbs, gutters and similar cement concrete structures, bituminous materials, all rock or gravel road surfacing materials, abandoned sewers, and other pipes and conduits, logs, piling, footings, foundations, vaults and chambers, when such materials are -within the limits of excavation. Volumes of such items from within excavation areas shown will be included in excavation quantities.

Remove remaining ends of abandoned pipes, or portions of other items after partially removed under this work, which would be left exposed after final excavation, to within a minimum of one (1) foot of the finished grade or elevation. Plug, seal, or grout fill abandoned pipes in backfill or embankment areas as approved.

Abandoned tracks are in those streets as shown on the Plans. Remove street surfacing, rails, ties, bricks, concrete foundations and all track appurtenances, by cutting or other approved methods.

For sewer and water main construction, remove only those portions of the track and track appurtenances that require removal to ensure utilization of proper construction methods to complete the work. Regardless of whether the track appurtenances are removed in part or in their entirety, the pay limits for the trench excavation and backfill, pavement base and pavement replacement, shall be as specified in Division 4 -SEWERS.

Payment for all work in this section and repair of any damage will be considered incidental to the work and included under bid items for Excavation, Excavation and Backfill, or other specified earthwork items.

In removing pavements, curbs, driveways and similar structures, all cuts where an abutting structure or a part of a structure is to be left in place shall be clean, smooth, vertical cuts made with a concrete saw or other approved cutting device to lines established by the Owner's Representative. All sawcutting will be considered incidental unless otherwise noted in the proposal or special specifications.

204.3.04 BELGIAN PAVING BLOCKS

When Belgian Paving Blocks (Cobblestones) are encountered during excavation, conform to requirements of subsection 204.3.24 -SALVAGE (C).

204.3.05 LIMITS OF EXCAVATION

Excavate to the depths and widths designated, allowing for forms, shoring, working space, gravel or sand base, and finish topsoil where required. Do not excavate deeper than elevation shown without approval. Excavation carried below grade lines shown or established without approval shall be replaced with approved compacted gravel; overexcavation under footings shall be filled with concrete of strength equal to that of the footing; and cuts below grade shall be corrected by similarly cutting adjoining areas and creating a smooth transition, all at no additional expense to the Owner.

204.3.06 SLOPE GRADING

Make slopes free of all exposed roots, unstable rock, and loose stones exceeding 3 inches in diameter. Shape tops of banks to circular curves with, in general, not less than a 6 foot radius, unless rock makes such work impractical. Trim all surfaces neatly and smoothly.

Overexcavating and backfilling to the proper grade will not be accepted.

204.3.07 FOUNDATION N STABILIZATION

If, in the judgment of the Owner's Representative, material in the bottom of an excavation is unsuitable for supporting foundations, piers, retaining walls, cribbing, sewers, pipes, or similar facilities, overexcavate as directed and backfill to required grade with material conforming to Subsection 204.2.02 FOUNDATION STABILIZATION. Compact in layers not exceeding 6 inches deep to required density unless otherwise approved, and grade as directed.

204.3.08 COMMON EXCAVATION AND CONCRETE EXCAVATION

Perform all excavation defined in Subsections 204.1.03B COMMON EXCAVATION and 204.1.03C CONCRETE EXCAVATION, regardless of the type or nature or conditions of the material encountered. Method of excavation used is optional. Use hand methods for excavation that cannot be accomplished without endangering existing or new structures or other facilities.

When the precise location of subsurface structures is unknown, locate such structures by hand excavation prior to utilizing mechanical excavation equipment.

204.3.09 ROCK EXCAVATION AND EXPLOSIVES

204.3.09A DEPTH OF EXCAVATION

Excavate to the depths designated or as shown on the appropriate Standard Plan. Correct over-excavation with compacted material as directed at no additional expense to Owner. In trenches for sewers, and water mains or conduits, remove all material necessary to provide a minimum clearance of 6 inches under the pipe and replace with bedding material in conformance with Subsection 204.2.03 PIPE BEDDING.

204.3.09B METHODS AND RECORDS REQUIRED

Before rock removal by systematic drilling and blasting or other methods will be permitted, notify Owner's Representative who, with Contractor or his representative, will determine the amount of material to be removed as rock excavation and will record the information. Then drill, blast, or break with power-operated tools specially designed for rock excavation, and excavate the material.

204.3.09C USE OF EXPLOSIVES

Obtain any and all permits required for use of explosives from Portland Fire Bureau and the Office of Transportation of the City of Portland.

Use of explosives shall be avoided as far as practicable, and in no case shall tunnel blasting methods be used. Such blasting as must be done shall be controlled in a manner which will avoid possible shattering or loosening of materials back of lines to which the excavations are to be made. All blasting shall be supervised and/or done by a state certified powderman. Be responsible for any and all damages to property or injury to persons resulting from blasting, or accidental or premature explosions that may occur in connection with the use of explosives. Give adequate warning to all affected persons and adjacent property owners prior to blasting.

Where excavations in hard, solid rock are to be made to depths of 10 feet or more, blasting thereof shall be done by the presplitting or preshearing method unless other methods are approved by Owner's Representative.

204.3.09D TRENCH BLASTING

When blasting rock in trenches, cover area to be shot with blasting mats or other approved type of protective material that will prevent scattering of rock fragments outside of the excavation.

204.3.10 DISPOSAL OF EXCESS MATERIALS

The Contractor is strongly encouraged to dispose of materials created by excavation or demolition at sites which recycle these materials. This section applies to materials that, as directed by the City Engineer, are not suitable for reuse, such as, but not limited to: concrete, rebar and other metals, asphalt concrete, base aggregate, subgrade and trench spoils. The Contractor should contact the following sites, which may be available for the recycle of excavated materials:

East County Recycling
12409 NE San Rafael
Portland OR 97230
(503) 253-0867

Ken Leahy Construction
SW 72nd
Tigard OR 97223
(503) 359-5323

Porter Yett
5949 NE Culley Blvd
Portland OR 97218
(503) 282-3251

Dan Obrist Recycling
4540 SE 174th
Portland OR 97236
(503) 667-4042

KF Jacobsen (Recycle Asphalt only)
1208 N River
Portland OR 97227
(503) 282-0983

Pacific Rock Products
6637 SE 100th
Portland OR 98266
(503) 777-7924

Portland Sand & Gravel
10717 SE Division
Portland OR 97266
(530) 252-3497

Dan Obrist Recycling (Wood & Debris also)
4044 N Suttle Rd.
Portland

It is the Contractor's responsibility to meet whatever criteria the sites listed above require for material to be disposed of at their recycle sites. See Section 205.2.12D for information on Recycled Aggregates. In addition, excavated materials may be deposited on one or both of the following sites: (A) at predesignated sites contained in the Contract Documents, and (B) sites supplied by Contractor. All costs for disposing of this excess material shall be included in the bid item for Excavation or Excavation and Backfill as contained in the project bid.

This section does not preclude the opportunity for the Contractor to process these materials to meet current standards for reuse.

204.3.10A DISPOSAL ON PREDESIGNATED SITES

When sites for excess material are contained on the plans, disposal operations shall be performed as Owner's Representative may direct. Owner will secure all necessary disposal permits for required work done under this Subsection.

204.3.10B SITES PROVIDED BY CONTRACTOR

All excess material not required for preceding Subsection will be disposed of by Contractor at his option and he shall be entitled to receive any reimbursement that he can secure from sale of such material. Within the City of Portland, no excess material shall be deposited on an unimproved dedicated street area without a permit from Owner's Representative, and no excess material shall be deposited on any private property without a fill permit from Owner's Bureau of Buildings. Prior to filling, furnish copy of fill permit to Owner's Representative.

204.3.11 TEMPORARY LOCATION OF EXCAVATED MATERIALS

Place excavated material, suitable for embankment or backfills and not excess material, only within the construction easement, right-of-way, or approved working area. Pile in such a manner that it will cause a minimum of inconvenience to the public. Furnish the Owner's Representative a copy of written approval from each property owner prior to stockpiling material on private property.

Provide free access to all fire hydrants, water valves, and meters, and leave clearance to enable free flow of storm water in all gutters, conduits, and natural watercourses.

204.3.12 OVER EXCAVATION FOR ROADWAYS

Remove unapproved subgrade material to such depths as directed. Excavation below subgrade shall be of the same classification as that above subgrade provided it is removed in the same operation. When roadway excavation has been completed and it is required to move equipment back in to excavate unsuitable material, or where additional excavation depth requires special equipment because of the presence of shallow utilities or other unforeseen conditions, perform the work as directed and payment for excavation below grade will be made on the basis of Extra Work as provided in the GENERAL CONDITIONS. See Section 301 SUBGRADE for other subgrade work.

Excavate below grade and backfill to restore surface as directed, when required by negligence in work operations, at no expense to Owner.

Overbreak is defined as that portion of any material which is excavated, displaced or loosened outside and beyond slopes, lines, or grades as staked or re-established, with exception of slides, regardless of whether overbreak is due to blasting, to inherent character of any formation encountered, or to any other cause. Remove and dispose of all overbreak at no expense to Owner.

204.3.13 SURFACE REMOVAL AND REPLACEMENT FOR TRENCHES

204.3.13A REMOVAL AND REPLACEMENT OF TOPSOIL

Where trenches within easements cross lawns, garden areas, pasture lands, cultivated fields, or other areas on which reasonable topsoil conditions exist, remove topsoil to a maximum depth of 12 inches for full width of the trench to be excavated. Protect and stockpile topsoil to one side of the easement in a location satisfactory to the property owner and do not mix with remaining excavated material. Replace topsoil in the top 12 inches of backfilled trench.

Maintain finished grade of topsoil level with area adjacent to the trench until final acceptance by Owner's Representative. Repair damage to adjacent topsoil caused by work operations. Remove all rock, gravel, clay, and any other foreign materials from surface; regrade, and add topsoil as required.

In lieu of stockpiling topsoil, approved imported topsoil as defined herein, may be substituted in the top 12 inches at no expense to Owner.

Payment for removing, stockpiling and replacing topsoil in the trench is included in the bid item, Trench Excavation and Backfill, and no further compensation will be made unless directed by Owner's Representative to place imported topsoil material.

204.3.13B REMOVAL AND REPLACEMENT OF PAVEMENT, CURB, DRIVEWAYS AND SIDEWALK

The final cut joint for all asphaltic concrete pavement must be made with a saw or wheel saw. A jack hammer cannot be used to remove the pavement if there is concrete underneath.

Saw Portland cement concrete pavement to a minimum of 75% of total depth. Saw curbs and sidewalks to a minimum depth of four (4) inches. Subsequent removal may be accomplished by using a jackhammer. Full depth cut by pavement saw can be done at option of Contractor, but at no additional cost to Owner. Use of any machine utilizing a falling or swinging weight will not be permitted.

Width of cut for trenches shall be minimum width necessary for the excavation and shall follow lines parallel to pipe centerline. Remove all loose, undermined or damaged pavement.

If the edge of the new pavement (not the trench) is less than 2’ from the edge of another patch, curb, or construction joint the pavement between the two must be replaced. If there is more than one edge within the 2’ zone, then pavement is removed to the far edge, or as directed by the Owner's Representative.

If at least one edge of the trench resurfacing falls within a marked bike lane, the top surface of pavement within the entire bike lane must be replaced.

Trench resurfacing on all streets shall be tee-cut with a minimum width necessary for excavation plus a minimum 6” from outside edge of trench. The cut shall follow lines parallel to pipe centerline.

Minimum width of pavement replacement on all streets except for Local Service Streets shall be 3' in any horizontal direction. See Standard Plan 3-65 – TRENCH RESURFACING ON ALL STREETS

Pavement replacement on Local Service Streets must be a minimum of 12" in any horizontal direction.

If trenching and restoration occurs within a sidewalk, the sidewalk must be replaced to the nearest joint in all directions. If trenching and restoration occurs within a driveway, the driveway must be replaced to its full original width and depth.

All striping and pavement markings must be fully restored to their original layout and material, or as directed by the Owner's Representative.

Any concrete not scheduled for removal, which is damaged by construction activities, shall be saw cut, removed and replaced at no expense to Owner.

Replacement of pavement, curb, and sidewalk shall conform to the requirements for RESURFACING contained in DIVISION 4 -SEWERS, or as specified on the construction plans.

204.3.14 TRENCH EXCAVATION AND SHORING

204.3.14A WORK LIMITS

On storm and sanitary sewer projects the length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall it exceed one hundred (100) feet unless authorized in writing by the Owner's Representative. Unless otherwise specified the length of unrestored work area and total unfinished trench construction shall not exceed a length of 800 feet, for each main pipe laying operation. For the purpose of this section, two or more main pipe laying operations may be considered as one if they are adjacent or cause a disturbance to the same neighborhood as determined by the Owner's Representative. Unless otherwise approved, if the unfinished trench or restoration exceeds 800 feet in length, the main line pipe construction shall be suspended and shall not be resumed until authorized by the Owner's Representative. A section of trench shall be considered as unfinished, only for the purpose of establishing work limits, until excavation, main line and lateral construction, backfilling, compaction, gravel road restoration, pavement base, Portland cement concrete, asphaltic concrete pavement, sidewalk, landscaping, property restoration, cleanup operations and pipe testing have been completed. Cleanup of the construction area shall include full resurfacing and cleaning of area so as to allow use of trench and adjacent construction area for normal use as required in Section 208 RESTORATION AND CLEANUP. In the sole discretion of the Owner's Representative, if weather conditions will not allow Contractor to place final pavement surfacing, a base lift of asphaltic concrete and/or cold mix asphalt may be allowed temporarily at various times during the project dependent on type of street, area, contractor methods and other considerations of the Owner's Representative.

204.3.14B TRENCH WIDTH

The trench width at the ground surface shall be kept to a minimum necessary to install the pipe in a safe manner. In all cases, trenches must be of sufficient width to allow for shoring and permit proper joining of pipe and compaction of the backfill material along sides of the pipe. Minimum trench width, in the pipe zone, must provide a clear working space of 9 inches on each side of the barrel for pipe or conduit, except for sewer pipes, and 6 inches on each side of the barrel for sewer pipe.

Do not exceed any maximum trench width shown on the Plans. If there is a maximum width shown and said width is exceeded by Contractor without written authorization, Contractor will be required, at no expense to Owner, to provide pipe of a higher strength designation, a higher class of bedding, or both, as directed by the Owner's Representative. All trenches shall be excavated with vertical walls unless otherwise specified.

Make the excavation for manholes and other structures wide enough to provide a minimum of twelve (12) inches between sides of structure and sides of excavation.

Confine top width of trench to dedicated rights-of-way or construction easements. Special written agreements to extend width may be made by the Contractor with affected property owner, provided the Owner's Representative first approves such an agreement.

When trenching within areas of improved streets, sidewalks, driveways or other improved areas to be restored or protected, the trench width of the pavement shall be 6 inches wider on each side than the remaining trench width, unless otherwise specified per Section 204.3.13B - REMOVAL AND REPLACEMENT OF PAVEMENT, CURB, DRIVEWAYS AND SIDEWALK. (See Standard Plan No. 4-01).

204.3.14C GRADE

Excavate trench to lines and grades shown or as established by Owner's Representative, with proper allowance for pipe thickness, pipe bedding and foundation stabilization. The subgrade upon which bedding is to be placed shall be firm, undisturbed and true to grade. If the trench is overexcavated, restore to subgrade with material of type specified for pipe bedding at no expense to Owner. Place material over full width of the trench in compacted layers not exceeding 6 inches deep to established subgrade with allowance for pipe bedding.

204.3.14D SHORING. SHEETING, AND BRACING OF TRENCHES

Sheet and brace trench when necessary to prevent caving and to protect adjacent structures, property, workers, and the public. Maintain sheeting until pipe has been placed and backfilled at the pipe zone. Remove shoring and sheeting as backfilling is done, in a manner that will not damage the pipe or permit voids in the backfill.

Where flexible pipe (PVC, HDPE sewer pipe) is used, provide a trench support system that can be removed as backfilling is done, in a manner that will not disturb the compacted pipe bedding material between the pipe and the undisturbed trench wall, damage the pipe, or permit voids in the backfill.

All sheeting, shoring, and bracing of trenches shall conform to safety requirements of the Federal, State, or local public agency having jurisdiction. The most stringent of these requirements shall apply.

204.3.15 DEWATERING

Furnish, install, and operate all necessary machinery, appliances, and equipment to keep excavations free from water during construction. Dewater and dispose of water so as to prevent injury to public or private property, or nuisance or menace to the public. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. Have available at all times competent workmen for operation of the pumping equipment. Control surface runoff to prevent entry or collection of water in excavations. All excavations shall be kept free of water when concrete is being deposited or during placement of backfill.

Control ground water such that softening of the bottom of excavations or formation of "quick" conditions or "boils" during excavation shall be prevented. Design and operate dewatering systems so as to prevent removal of natural soils and so that ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

Before dewatering is started, submit to Owner's Representative a statement of the method, installation, and details of dewatering system proposed to be used. Open and cased sumps shall not be used as primary dewatering for excavations deeper than 3 feet below static water table unless authorized.

Release ground water to its static level in such a manner as to maintain the undisturbed state of natural foundation soils. Prevent disturbance of compacted backfill and flotation or movement of structures, water mains, sewers, and other utilities

Payment

Lump Sum Basis - When shown in the Bid, payment will be made on a lump sum basis for developing and engineering a dewatering plan, installing dewatering system, pumping and maintaining system including all necessary drilling, piping and incidentals.

Incidental Basis - When not shown in the Bid, dewatering shall be considered as incidental to, and all costs included in, the various contract pay items in the Bid.

204.3.16 EMBANKMENT

204.3.16A ROADWAY EMBANKMENT

Preparation of Embankment Foundations - Prior to construction of embankments, excavate unstable material or unsuitable foundation material and dispose of as directed. Limit excavation to lines, grades and cross sections shown on Plans or approved. Backfill basements, trenches and holes which occur within embankment limits with approved material, which may include small pieces of broken concrete and masonry. Break concrete floors of basements as approved. Compact natural ground underlying embankments to the depth of grubbing or a minimum of 12 inches, to density specified for the embankment material to be placed.

Embankment Construction - Place embankments and fills of all kinds in approximately horizontal layers of a maximum of 8 inches in thickness and compact each layer separately and thoroughly to density specified unless otherwise approved by the Owner's Representative.

In the immediate vicinity of curbs, walks, driveways, inlets, manholes and similar structures, in holes, and where embankment and fill materials cannot be reached by normal compacting equipment, compact to specified density by approved methods.

Where embankments are constructed predominantly of rock fragments, place material in layers of a thickness as directed by the Owner's Representative. Placing of individual rock fragments having dimensions greater than 3 feet will be permitted provided that they have no dimensions greater than 6 feet, that clearances between adjacent fragments provide adequate space for placing and compacting of material in horizontal layers as specified, and that no part comes within 4 feet of subgrade. Distribute and manipulate rock so that interstices between larger pieces are filled with smaller pieces, forming a dense and compact mass.

Exercise caution to ensure that embankment construction and fill does not move, endanger or overstress any structure. Place and compact embankments at the end of bridges and extend a distance 3 times fill height from each bridge end prior to the time that work begins on the bridge ends. Do not construct embankments when embankment material, foundation, or embankment on which it would be placed is frozen.

Compacting and Density Requirements - Embankments -In embankments, fills and backfills, the compacted materials within 3 feet of established subgrade elevation shall have a density in place of not less than 95% of Standard Proctor maximum density, and below 3 feet shall have a density in place of not less than 90% of Standard Proctor maximum density, and will show no appreciable deflection or adverse reaction under the compacting equipment during compaction.

Cuts and foundations -In roadbed cuts, and in foundations for structures, the compacted materials to a depth of 1 foot below established subgrade or foundation elevation shall have a density in place of not less than 95% of Standard Proctor maximum density.

Perform watering of materials to provide compaction of embankments and backfills and to alleviate dust nuisance as specified in DIVISION 3 -STREETS, or as directed.

Embankment or backfill. materials shall not be placed in final position until moisture in excess of optimum moisture has been removed.

Slide Removal and Repair - Side slopes shall be constructed as staked or re-established. In case a slope, finished to the lines as staked or re-established, slides back of established slope into the roadway prism, or out of an embankment before final acceptance of the work, remove slide material and reconstruct the slope as directed. Reconstruction will be paid for as extra work, unless due to negligence by Contractor.

Obtain materials to replace embankment slides from approved source. Repair slopes undercut at the base or destroyed in any manner due to negligence during the work by resloping parallel to the damaged slope or as approved, at no expense to Owner.

204.3.16B PIPELINE EMBANKMENT

Where embankments are to contain water mains, conduits, or sewers, construct embankment to support pipe in accordance with details shown on the Plans. Use excess excavated trench material suitable for embankment, or approved imported material as directed. Embankment shall be made in 1 foot lifts, with minimum compaction of 95 percent of Standard Proctor maximum density.

Additional Pipe Cover - In locations where insufficient pipe cover exists, place excess excavated trench material suitable for embankment over the pipe as shown or directed to provide a minimum cover of 3 feet. Compact as required for underlying trench backfill.

204.3.16C STRUCTURAL EMBANKMENT - Deposit approved material free from roots, organic material, trash, and any stones larger than 3 inch diameter in lifts not exceeding an 8 inch loose thickness across the full width of embankment unless otherwise approved by Owner's Representative. Compact each lift to 95 percent of Standard Proctor maximum density.

204.3.17 BEDDING

204.3.17A BEDDING FOR RIGID SEWER PIPE

Construct bedding in conformance with the appropriate Standard Plan. Approximate limits for various classes of bedding will be shown on the Plans. Owner's Representative shall have the authority to change bedding classifications and limits thereof as necessary during construction.

Class A bedding consists of a pipe cradle of Portland cement concrete as specified on the appropriate Standard Plan. Reinforcement steel may be required, at no cost to Owner. Bottom of trench shall be fully compacted before placement of pipe or cradle. Place concrete in such a manner that no dirt water, or foreign material becomes mixed with the concrete. Allow concrete sufficient time to reach initial set before any additional backfill material is placed in the trench. Conform to applicable provisions for Concrete Encasement in DIVISION 4-SEWERS.

Class B bedding consists of leveling the bottom of trench or top of foundation material and placing bedding material to the horizontal centerline (springline) of pipe. Bedding material shall be as specified above and as shown on the appropriate Standard Plan. Bedding shall be placed in at least two lifts. Place first lift to provide minimum depth of bedding material shown on the appropriate Standard Plan before pipe is installed. Spread smoothly to proper grade so that pipe is uniformly supported along the barrel. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint. Bedding under pipe shall provide a firm, unyielding support along entire pipe length. Place subsequent lifts of not more than 6 inches thickness up to the horizontal centerline of the pipe. Bring lifts up together on both sides of pipe and carefully work under pipe haunches by slicing with a shovel, vibration, or other approved procedure, to ensure the bedding material is well compacted.

Class C bedding shall conform to requirements for Class B bedding except that bedding material shall be placed only to approximately the lower quadrant of pipe as shown on the appropriate Standard Plan.

Class B and C bedding shall be considered to include full width of excavated trench from the bottom of trench or top of foundation stabilization material to the top of bedding.

Particular attention must be given to the area from the flow line to horizontal centerline of pipe or top of bedding to ensure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of pipe zone.

204.3.17B BEDDING FOR FLEXIBLE SEWER PIPE

Unless otherwise specified, material for bedding flexible sewer pipe shall be 3/4 0" crushed rock placed a minimum of 4" under the pipe, between the sides of the pipe and the undisturbed trench walls, and to the top of the pipe zone (12" above the top of the pipe).

First lift shall provide the minimum. 4" thickness under any portion of the pipe, and shall be placed before the pipe is installed. Spread smoothly so that the pipe is uniformly supported along the barrel. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

Install subsequent lifts of not more than 6" thickness to the top of the pipe zone and individually compact to 90 percent of standard proctor maximum density. Bring lifts up together on both sides of pipe and carefully work under pipe haunches by slicing with a shovel or other approved procedure to assure bedding material is well compacted.

204.3.17C BEDDING FOR WATER PIPE

Place bedding to a minimum thickness of 6 inches below the outside bottom of the pipe barrel or conduit and compact with mechanical vibrating or impact tampers to a minimum of 95 percent of Standard Proctor maximum density**.** For coal tar coated steel pipe, 3/4" -0" bedding material is not acceptable. In areas where suitable native sand bedding material is encountered, and the Owner's Representative waives the 6 inch excavation below outside bottom elevation of the pipe barrel or conduit, prepare the bottom of the trench to ensure proper bedding for the pipe and its appurtenances.

204.3.18 PIPE ZONE BACKFILL

204.3.18A SEWER PIPE

Place specified pipe zone material carefully around the pipe in 6 inch layers and thoroughly hand tamp. Prevent pipe from movement either horizontally or vertically during placement and compaction of pipe zone material.

When, in the Owner's Representative's judgment, insufficient or unsuitable material exists at trench side for placement in the pipe zone, import and place approved material. Extra payment for providing and placing approved imported backfill in pipe zone will be made only when so directed by the Owner's Representative.

204.3.18B WATER PIPES

For coal-tar coated steel pipe, 3/4" -0" pipe zone material is not acceptable. Place specified pipe zone backfill carefully around the pipe. Do not allow sharp, heavy pieces of material to drop directly onto or contact the pipe. Prevent pipe from movement both horizontally and vertically. Compact pipe zone backfill to a minimum of 95 percent of Standard Proctor maximum density or as specified by the Owner's Representative. Place and compact material as follows:

Crushed Rock and Approved Native Pipe Zone Material - Backfill in lifts not to exceed 6 inches loose depth and hand tamp each lift to the top of the pipe, place the additional 12 inches of backfill over the pipe and compact with mechanical vibrating or impact tampers.

Sand Pipe Zone Material - Backfill as specified for crushed rock and approved native pipe zone material, or backfill to top of pipe and water settle as specified in Subsection 204.3.19 TRENCH BACKFILL AND COMPACTION. Place the additional 12 inches of backfill over the pipe and compact with mechanical vibrating or impact tampers.

When, in the Owner's Representative's judgment, insufficient or unsuitable material exists at trench side for placement in the pipe zone, import and place approved material. Extra payment for providing and placing approved imported backfill in pipe zone will be made only when so directed by the Owner's Representative.

If the trench width (not the pavement restoration) is 12” or less and in a paved area of the public right-of-way, then Controlled Low Strength Material (CLSM) must be used, per 204.1.10 TRENCH BACKFILL.

204.3.19 TRENCH BACKFILL AND COMPACTION

Unless otherwise approved by the City Engineer, imported granular backfill materials meeting the requirements of Section 204.2.06 IMPORTED GRANULAR BACKFILL MATERIAL shall be used as backfill in all trenches within the public right-of-way. If the trench width (not the pavement restoration) is 12" or less and in a paved area of the public right-of-way, then Controlled Low Strength Material (CLSM) must be used, per 204.1.10 TRENCH BACKFILL Place and compact backfill in conformance with the appropriate Standard Plan. Resurfacing shall be as specified in DIVISION 4 -SEWERS, and as shown on Plans.

All materials and areas which are not susceptible to testing for density, as determined by the Owner's Representative, shall be compacted in place by whatever equipment and method is practicable or specified, and as approved by the Owner's Representative. Compaction shall be performed at such moisture content as is required to produce well-filled. dense and firm material in place which will show no appreciable deflection or reaction under the compacting equipment used.

The Owner's Representative will sample excavated material to determine suitability of selected native material for backfill use. If native material is found to be compactible and within tolerance range of moisture content, use the suitable native material for backfilling Take reasonable precautions to prevent approved excavated material from becoming mixed with unsuitable material or from becoming wet or frozen and exceeding the critical moisture limits, if approved native material does become contaminated with unsuitable native materials or wet or frozen and exceeds the critical moisture limits through negligence, replace with imported granular material at no expense to Owner. In unpaved areas, extra payment for providing and placing approved imported backfill will be made only when specifically directed in writing by the Owner's Representative.

Moisture condition trench backfill material according to 204.3.23A MOISTURE CONTROL.

Backfill trench above the pipe zone to the specified grade, or as shown on the Plans, in lifts of 8 inch loose depth to 3 feet loose depth depending on compaction equipment and material, unless water settling combined with mechanical compaction is allowed as provided herein,

Compact all trench backfill to a minimum of 95 percent of Standard Proctor maximum density in paved areas and in street right-of-ways or 90 percent in other areas, or as specified by the Owner's Representative, with mechanical vibrating or impact tampers. Then place and compact crushed aggregate base material or topsoil as specified. When using Controlled Low Strength Material (CLSM), the unconfined compressive strength must meet the specifications of 204.2.06D CONTROLLED LOW STRENGTH MATERIAL (CLSM) FOR NARROW TRENCH APPLICATIONS.

When non-cohesive backfill is approved to be placed mechanically and water-settled, push backfill material onto the slope of backfill previously placed and allow to slide down into the trench. Do not push backfill into the trench in such a way as to permit free fall of material until at least 2 feet of cover is provided over the top of pipe. Under no circumstances allow sharp, heavy pieces of material to drop directly onto the pipe or tamped material around the pipe. Do not use backfill material of consolidated masses larger than 1/2 cubic foot. The procedure and equipment to be used for backfill compaction shall be demonstrated on a test section of pipeline to be designated by the Owner's Representative. Said test section shall not exceed 200 feet in length.

Excavate test pits in the backfill as directed by Owner's Representative to demonstrate that the specified compaction has been obtained for the entire depth of the backfill. At the option of the Owner's Representative, density tests may be taken in a lift of compacted backfill immediately before placing the next lift. In general, one (1) successful test for the entire backfill depth and three successful tests at lesser depths per 400 linear feet of pipe installed will be required. Additional successful tests at lateral crossings at various depths may also be required. All costs in connection with excavating test pits, shoring, backfilling and from standby time during field density test shall be considered as incidental to backfill and shall be included in unit prices bid for the various items involved.

If required compaction density has not been obtained, remove the backfill from trench, replace with approved backfill, and recompact to the specified density. Then, should routine field densities taken during the course of construction show the specified compaction is r -t being obtained because of changes in soil types or for any other reason, the compacting procedure will be modified. In no case will excavation and pipe-laying operations be allowed to proceed until the specified compaction is attained. The Owner's Representative shall have the right to require changes in methods to accommodate changes in soil conditions.

When, in the judgement of the Owner's Representative, backfill material is approved as non-cohesive soil, water settling, combined with mechanical compaction, may be substituted as an alternate compaction method. Water settlement will not relieve Contractor of responsibility for obtaining the specified density. Determine procedures and provide the quantity of water required in every case to effect complete water settlement of backfilled materials. Do not, under any circumstances, insert the jetting pipe closer than 2 feet above top of pipeline.

Any subsequent settlement of trench and adjacent pavement areas during the maintenance period shall be considered to be the result of improper compaction and shall be promptly corrected as required under Subsection 107.14 TWO (2) YEAR MAINTENANCE AND WARRANTY in the GENERAL CONDITIONS.

Where topsoil existed prior to excavation, replace the uncontaminated native material in the top 12 inches of trench. Compact and grade to match the ground surface adjacent to trench. Maintain surface of backfilled trench level with existing grade until the end of the contract maintenance period.

In paved and graveled areas maintain surface of the backfilled trench level with 3/4" -0" crushed aggregate material Controlled Low Strength Material (CLSM), or temporary pavement as directed, until the final pavement replacement is completed. Place temporary pavement in conformance with RESURFACING in DIVISION 4 -SEWERS.

Maintain all temporary trench surfaces in a safe condition, to the satisfaction of the Owner.

Maintain backfilled trench surface between any two successive manholes until the following operations have been completed and approved by the Owner's Representative:

1. Service connections installed, backfilled, and compacted, including water settling when required.
2. Construction of manholes and appurtenances.
3. Hydrostatic or air testing.
4. Cleanup and restoration of all physical features.
5. Utilities restored to their original condition or better.
6. All work required between the two manholes accomplished.

Do not undertake final pavement replacement until all items outlined above have been completed and approved.

Maintenance of backfilled trenches is considered as incidental to this item of work, and payment for such maintenance will be considered as included in payment for Excavation and Backfill, except for temporary pavement when directed.

Compaction, including water settling, of backfilled trenches is included as part of the backfilling procedure, and payment will be considered to be incidental to the item for Excavation and Backfill.

Unless otherwise approved by the City Engineer the following backfill materials are required:

a) Outside of the public right-of-way selected native backfill material and/or imported granular backfill material, per Section 204.2.05 and 204.2.06 respectively.

b) Within the public right-of-way, unless noted otherwise below, imported granular backfill material per Section 204.2.06.

c) Within paved areas in a public right-of-way with a trench width of 12" or less - CLSM, per Section 204.2.06D

Place and compact backfill in conformance with the appropriate Standard Plan. Resurfacing shall be as specified in DIVISION 4 - SEWERS, and as shown on Plans.

204.3.20 WATER COURSE UNDERCROSSINGS

Backfill undercrossing of water courses with approved impervious material in the top 2 feet of stream bed and 2 feet into stream banks. Compact to a minimum of 95 percent of maximum density as determined by ASTM D 698-78 (delete paragraph 5.1). Payment for water course undercrossing will be considered as incidental to other pay items of work.

204.3.21 RIPRAP

When specified and shown on Plans, construct filter blanket and riprap as required in Section 610 SLOPE PROTECTION.

204.3.22 WATERLINE TRENCH BACKFILL AND COMPACTION

Conform to applicable requirements contained in Subsection 204.3.19 TRENCH BACKFILL AND COMPACTION, with the following exceptions:

204.3.22A COMPACTION DENSITY

Compaction of backfill shall conform to the density as shown on Plans or as specified.

204.3.22B MAINTENANCE OF BACKFILLED WATER LINE TRENCH

Maintain backfilled trench surface between any two successive valves until the following operations have been completed and approved by Owner's Representative:

1. Service connections installed and backfillcd.
2. Valves, valve boxes, and hydrants installed.
3. Hydrostatic testing.
4. Flushing and sterilization.
5. Cleanup and restoration of all physical features.
6. Utilities restored to their original condition or better.
7. All work required between the two valves accomplished including restoration of surface to specified condition.

204.3.23 STRUCTURAL BACKFILL AND COMPACTION

204.3.23A MOISTURE CONTROL

Condition backfill material to within 2% of optimum moisture content required for compaction, as determined by ASTM D 698 throughout each lift of the fill.

Add moisture to material that is not predominantly granular by nature, preferably at the site of excavation. Add moisture to granular backfill by sprinkling during compaction operation. Do not compact nongranular material if it is significantly above optimum moisture content.

Aereate by such processes as scarifying, blading or discing to reduce moisture content.

204.3.23B NATIVE BACKFILL AROUND STRUCTURES

Place backfill around concrete structures only after the concrete has attained 2/3 of its specified compressive strength. Remove all form materials and trash from the excavation before placing backfill.

Place native backfill in all areas, unless otherwise shown or directed. Place backfill around piers and columns on all sides to approximately the same elevation at the same time. Backfill in front of abutments and walls shall be placed first to prevent the possibility of forward movement. Take special precautions to prevent any wedging action against the concrete. Destroy slopes bounding the excavation by stepping or roughening to prevent wedge action. Deposit material from the excavation in lifts not exceeding 8-Inches loose thickness. Compact each lift to at least 95 percent of Standard Proctor maximum density before placing the next lift. Jetting or puddling will not be permitted. Make adequate provision for thorough drainage of all backfill.

Earth-moving equipment shall not be operated within 5 feet of walls of concrete structures unless approved. Compact backfill adjacent to concrete walls with pneumatic tampers or other approved equipment that will not damage the structure.

204.3.23C NATIVE BACKFILL NOT AROUND STRUCTURES

Place native backfill to lines and grades shown to produce a rough grade in areas containing no structures, paving, utilities or similar appurtenances, Material shall be deposited in lifts not exceeding 8 inches in loose thickness. Each lift shall be compacted to at least 90 percent of Standard Proctor maximum density before placing next lift.

204.3.23D IMPORTED GRANULAR BACKFiLL AROUND STRUCTURES

Place imported granular backfill in lifts not exceeding a 6 inch loose thickness. Compact each lift to 95 percent of Standard Proctor maximum density before placing next lift.

204.3.23E IMPORTED GRANULAR BACKFILL UNDER FOOTINGS AND SLABS

When shown on Plans or specified, natural ground shall be graded and prepared as approved, and imported crushed granular backfill placed under footings, slabs and other structures. Deposit material in lifts not exceeding a 6 inch loose thickness, and compact to 100 percent of Standard Proctor maximum density.

204.3.23F IMPORTED GRANULAR BACKFILL UNDER FACILITIES

When shown on Plans or specified, place imported granular backfill in previously excavated areas under piping, sidewalks, curbs, and similar structures and facilities. Place material in lifts not exceeding a 6 inch loose thickness, and compact each lift to 90 percent of Standard Proctor maximum density.

204.3.23G IMPORTED SAND BACKFILL

Use imported sand backfill wherever shown on Plans or directed, and for drainage blanket under vapor barriers, where such barriers are used beneath concrete slabs. Place material in lifts not exceeding 6 inches in loose thickness and compact to 95% of Standard Proctor maximum density.

204.3.24 SALVAGE

(A) Guard Rail and Posts

Save all metal guardrail that may be removed from a project along with wood or concrete posts. Notify the Structures Section, Bureau of Maintenance, City of Portland and deliver the material to a site designated by the Bureau. Delivery costs shall be included in the unit price for removal of guard rail.

(B) Horse Rings

When a metal horse ring is contained in a section of curb to be removed, Contractor shall remove the horse ring assembly without damage and shall reinstall in the new curb at the same project stationing, or as close as practical. In the event no curb is replaced, such as new driveway location, Contractor shall give the ring(s) to City's Bureau of Maintenance at Stanton Yard, 2835 N. Kerby Avenue. All costs related to removal and delivery or removal and replacement of each horse ring assembly shall be included in the unit cost of work which contains curb removal.

(C) Belgian Paving Blocks

Preserve quantities of 150 or more cobblestones (Belgian Paving Blocks) that may be removed in the course of excavation. These blocks shall become property of Owner. Notify the Operations Division, Bureau of Parks, City of Portland. Notification shall include location and estimated quantity of blocks, and then deliver cobblestones to a designated site as directed by the Bureau. All costs related to the removal and delivery of said cobblestones shall be included in the unit cost for excavation or excavation and backfill. Assume ownership of quantities less than 150, with disposition at Contractor's discretion.

(D) Manhole Frames and Covers

Manhole frames and covers removed by the Contractor shall become the property of the Owner. Notify the Owner's Representative a minimum of one day prior to removal to arrange for picking up the removed frames and covers.

(E) Dates and Names

Historical dates or street names in existing corners will be preserved, or will be re-stamped with addition of the current year, if corner has to be removed and reconstructed (e.g., 1933/1992).

A set of stamping tools is available for use through the Street Construction Office on a first-come, first-serve basis.

Payment for all work in this section will be considered incidental and shall be included in the bid item for concrete sidewalk.

204.4.00 MEASUREMENT AND PAYMENT

204.4.01 COMMON AND UNCLASSIFIED EXCAVATION

All common excavation and unclassified excavation will be measured on a cubic yard basis, all in original position prior to excavation. The quantity measured for payment will include only material excavated from within the limits defined herein. Any additional excavation outside of these limits, unless ordered in writing by Owner's Representative, shall be considered as having been made for Contractor's benefit and will be considered as incidental to the work.

Bidders should be aware that the quantity indicated by the bid item to be excavated and removed is only an estimate and actual quantity may be more or less than this.

204.4.01A STRUCTURAL EXCAVATION

Horizontal limits for measuring excavation shall be the sides of the trench or pit, except that no measurement or payment for excavation will be made for material removed outside vertical planes one foot outside and parallel to the neat lines of footings or bases for structures, or as shown on Plans.

Bottom limit for measurement shall be the elevation designated for the bottom of footing or base for the structure.

Upper limit for measurement shall be the ground surface at the site of work immediately prior to beginning work or the bed of the stream as it exists at the time excavation is started, with the following exceptions: (1) where excavation for the structure comes within the limits of roadway excavation areas, the upper limit shall be the planes of the bottoms and side slopes of those areas; or (2) where excavation for the structure comes within the limits of embankment to be constructed as a part of the contract, such embankment shall be constructed prior to construction or installation of the structure and upper limit shall be the planes of the new embankment at elevation designated for embankment construction.

If ordered by Owner's Representative, in writing, additional excavation below elevations shown will be measured the same as set forth herein, except that the upper pay limit will be the elevation shown for bottoms of footings or bases of the structure, and lower pay limit will be the elevation established by Owner's Representative for bottoms of footings or bases of the structure.

No measurement or payment will be made for excavations made below elevations established by the Owner's Representative for bottoms of footings or bases of structures nor for any other unauthorized excavation.

204.4.01B ROADBED AND SLOPE EXCAVATION

Pay quantities shall be computed to the neat lines of cross sections as staked or as otherwise directed.

204.4.01C TRENCH EXCAVATION AND BACKFILL

Volume for trench excavation and backfill will be measured and computed upon the following basis for length, width, and depth of trench:

Length - Length will be the entire horizontal distance on a linear foot basis measured along centerline of trench, including measurement through valves, fittings, couplings, manholes, or structure locations, except that the measurement through such structures will be deducted if the Proposal contains a separate provision for payment of trench excavation and backfill that is applicable to those structures. Length of service line pipes will be measured horizontally along the centerline of the trench from the centerline of the mainline pipe to the end of the service line pipe, including all fittings.

Measurement will be from center-to-center of valves, fittings, couplings, manholes, structures, or end of pipe, whichever is applicable.

Width (Sewer Pipe) - Width for calculating excavation for sewer pipes will be based on the diameter of the pipe barrel or width of the conduit, as follows:

Size of Sewer Pipe	Pay Width of Sewer Trench
6” to 12”	2.5 feet
15” to 36”	Outside Diameter Plus 12”
42” and larger	Outside Diameter Plus 24”

Width (Water Pipe) - Width for calculating excavation for water pipes will be the outside diameter of the pipe barrel, or outside width of non-circular conduits, plus 18 inches.

Depth - Depth for sewer pipe excavation and backfill will be the vertical measurement from the invert of the sewer pipe. Depth for water pipe excavation win be the vertical measurement from the bottom of the trench, including all extra excavation required for placement of pipe bedding, to the original ground or paved surface. Backfill for water pipe will be measured from the top of the pipe zone to the original ground or to the bottom of any surface concrete excavation. Concrete roadbed encountered in trench excavation shall be defined as unclassified trench excavation and paid accordingly.

Payment for surface restoration shall be within the limits designated in 204.3.13 – SURFACE REMOVAL AND REPLACEMENT FOR TRENCHES.

204.4.01D TRENCH EXCAVATION, BEDDING AND BACKFILL FOR INLET LEADS

There shall be no separate measurement or payment for trench excavation, bedding and backfill for storm sewer inlet leads as these items will be considered incidental to the bid item "storm sewer inlet leads".

204.4.02 EXPLORATORY EXCAVATION

Measurement for exploratory work shall be based upon the actual in place volume of material excavated and backfilled. Payment for exploratory work designated on the plans or specifically requested by the Engineer shall be made at the unit price bid for: common trench excavation and common backfill, asphalt concrete pavement replacement or other items as applicable to the work performed. All other exploratory work performed by the Contractor shall be considered incidental work for which no separate payment will be made.

204.4.03 ROCK EXCAVATION

204.4.03A STRUCTURAL ROCK EXCAVATION

Rock excavation will be measured on a cubic yard basis for the actual quantity removed within the limits of excavation as defined for common and unclassified excavation. Quantity for payment shall be the amount approved by Owner's Representative.

204.4.03B ROADBED AND SLOPE ROCK EXCAVATION

Rock excavation will be measured on a cubic yard basis for the actual quantity removed within the limits of excavation as defined for common and unclassified excavation. Quantity for payment shall be the amount approved by Owner's Representative.

204.4.03C TRENCH ROCK EXCAVATION

Rock-Excavation will be measured on a cubic yard basis as follows:

Length - Length will be the entire horizontal distance where rock is encountered measured on a linear foot basis along centerline of trench.

In sewer trenches, manholes and other structures will be excluded and will be measured separately. Measurement will commence at the first location where rock is encountered and continue to the point where rock terminates.

In trenches for water mains, valves, fittings, couplings, or structure locations will be included in the linear measurement, unless the Bid carries a separate item that is applicable to the structures.

Width - For sewers and water mains, the width for payment of trench rock excavation shall conform to applicable provisions of Subsection 204.4.01C TRENCH EXCAVATION AND BACKFILL.

Depth - Measurement for depth will be the vertical distance from top of rock to bottom of rock or a depth that is 6 inches below the sewer pipe or water main, whichever is less. Depth will be measured at intervals of 25 feet for sewers and 50 feet for water mains along centerline of trench, beginning at the first location that rock is encountered, and the average depth between measuring points will be the depth used for computing depth of rock.

Payment for rock excavation will be based on the unit price per cubic yard stated in the Bid and will be paid in addition to the payment for trench excavation and backfill except for water mains, where the volume paid for rock excavation will be deducted from the volume paid for common trench excavation. Payment for rock excavation shall include full compensation for all work necessary to excavate the rock material. No payment will be made for rock excavated below required grade or outside the widths mentioned above.

Rock excavation quantities for manholes and other structures shall be computed from the actual profile depth as above, multiplied by the area within a line parallel to and one foot outside of the actual dimensions of the manhole or structure base.

204.4.04 EMBANKMENT

Measurement for embankment compacted in place will be made on a cubic yard basis. Computation of volume for payment will be based on field measurement of the actual number of cubic yards constructed and accepted, complete within limits shown or directed; where applicable, this shall be within neat lines of the staked cross section.

No measurement or payment will be made for quantities required due to subsidence or settlement of ground or foundation, for settlement of materials within the embankment or for shrinkage, settlement, washout, slippage or loss regardless of cause, subject however to the provisions of 105.04 CONTRACTOR'S RESPONSIBILITY FOR WORK in Section 105 CONTROL OF WORK of the GENERAL CONDITIONS.

No deduction will be made for piers, columns, pipes or miscellaneous construction features constructed within embankment limits.

Payment shall constitute full compensation for all work and all materials used, whether obtained from the site of work or imported, complete as specified.

Trench excavation, bedding, and backfill placed in the completed embankment will be paid for separately for the particular item and class of construction.

204.4.05 FOUNDATION STABILIZATION

204.4.05A STRUCTURAL AND ROADWAY

Quantities for foundation stabilization will be made by field cross section survey of unstable areas prior to and after excavation, then computed using average end area method determined from the cross sections.

All labor and materials for foundation stabilization will be paid for at the unit price per in-place cubic yards as stated in the contract for foundation stabilization. No direct payment will be made for excavation and disposal of unsuitable foundation material and the cost thereof shall be included in the price stated in the contract for foundation stabilization.

204.4.05B TRENCH

Measurement for this item will be made on a cubic yard in place basis. Volume will be computed upon the following basis for length, width, and depth of trench:

Length - Length shall include only the actual linear footage of foundation stabilization used in the trench.

Width - Width shall conform to pay limits for trench excavation and backfill as contained in Subsection 204.4.01C TRENCH EXCAVATION AND BACKFILL.

Depth - Depth measured will be the actual depth placed as directed below the level of bottom of bedding. Depth will be measured at intervals of 25 feet for sewer or 50 feet for water mains, along centerline of trench, and the average depth between measuring points will be the depth used for computing the depth of foundation stabilization between measuring points.

General - Payment for this item shall constitute full compensation for all work necessary to furnish materials at trench side; for placing and compacting it in the trench; and in sewer pipe trenches, it shall include the extra depth of trench excavation required below pipe bedding grade to provide for a stable foundation for the pipe. Extra depth required for this item in water pipe trenches is included in payment for common trench excavation.

204.4.06 BEDDING

204.4.06A BEDDING FOR SEWER PIPE

Measurement by the Linear foot

Service Lines - Length of bedding will be measured from the connection to the mainline tee or wye to the end of the service line.

Other Lines - Quantities for bedding will be measured on a linear foot basis for class or type of bedding and size of pipe installed at depths and widths shown on the appropriate Standard Plan, or as specified. Length of bedding shall conform to the pay limits for the pipe installed.

General - Except for rock excavation, the above measurement and payment shall include full compensation for over-excavation to allow for placement of bedding material below pipe invert and all work necessary to furnish, place, and compact the bedding, complete as specified.

Measurement by the Cubic Yard

Quantities for bedding under this item will be measured on a cubic yard basis. Volume will be computed upon the following basis for length, width and depth of bedding:

Length - Service line length of bedding will be measured from the mainline tee or wye to the end of the service line. Length for other lines shall conform to the pay limits for the pipe installed.

Width - Width shall conform to pay limits for common and unclassified trench excavation and backfill as contained in Subsection 204.4.01C TRENCH EXCAVATION AND BACKFILL. Width upon which Class A sewer bedding will be calculated will be the width shown on the appropriate Standard Plan.

Depth - Depth of bedding will be calculated using Standard Plan 4-02.

The depth to be used in calculating the pay quantity when PVC pipe is used shall be 8" plus the outside pipe diameter, or as specified.

General - The pay quantity in cubic yards will be determined by subtracting the volume of the pipe based on the outside pipe barrel diameter from the volume of bedding material calculated by using the pay limits contained above.

Except for rock excavation, the above measurement and payment shall include full compensation for over-excavation to allow for placement of bedding material below pipe invert and all work necessary to place and compact bedding, complete as specified.

The standard outside pipe barrel diameters shown below shall be used where applicable.

See Figure 4 in DIVISION 4 SEWERS for bedding and backfill factors.

Pipe Size (I.D.)	C.S.P. (O.D.)	P.V.C. (O.D.)	Pipe Size (I.D.)	C.S.P. (O.D.)	P.V.C. (O.C.)
4	6.0	4.215	36	44.0	
6	8.0	6.275	42	52.0	
8	10.0	8.40	48	59.5	
10	12.5	10.50	54	66.5	
12	16.5	12.50	60	73.5	
15	20.0	15.30	72	86.0	
18	23.0		78	94.5	
21	26.5		84	101.5	
24	30.0		90	108.5	
27	33.5		96	115.5	
30	37.0		102	122.5	

204.4.06B BEDDING FOR WATER PIPE

Bedding for water pipe is included with pipe zone backfill and measurement and payment will be included under Subsection 204.4.07D PIPE ZONE BACKFILL FOR WATER PIPE.

204.4.07 BACKFILL

204.4.07A STRUCTURAL

Unless shown in the Bid, all backfill of the type specified shall be considered as incidental to and included in the pay item for the appurtenant structure or facility.

If structural backfill is specified as a pay item and shown in the Bid, measurement will be on a cubic yard basis. Horizontal and upper limits shall be measured the same as set forth in Subsection 204.4.01A STRUCTURAL EXCAVATION, for material actually placed between outside surface of the structure or facility and horizontal limits as defined. Lower limit shall be a plane at the bottom of the completed footings or structure, or lower outside surface of other facilities.

Any backfill outside of these limits will be considered as incidental, and all costs in connection with such backfill shall be included in the pay items shown in the Bid.

204.4.07B PIPE ZONE BACkFILL FOR SEWER PIPE

Payment for pipe zone backfill is included in the bid item Trench Excavation and Backfill and no further compensation will be made unless insufficient or unsuitable material for pipe zone backfill exists at trench side as determined by Owner's Representative.

When approved, pipe zone backfill material shall be imported and measured and paid for under the bid item for granular backfill material.

204.4.07C GRANULAR TRENCH BACKFILL MATERIAL FOR SEWER PIPE

Payment for this item will be made when imported granular material is specified or when directed by the Owner's Representative to be placed in the trench or pipe line embankment.

Work under this item for granular backfill material will be measured on a cubic yard basis. Volume will be computed upon the following basis for length, width, and depth of granular backfill:

Length - Length shall include only the actual linear footage of granular backfill material used in the trench.

Width - Width shall conform to pay limits for trench excavation and backfill as contained in Subsection 204.4.01C TRENCH EXCAVATION AND BACKFILL.

Depth - Depth of granular backfill will be the actual vertical depth placed as directed.

General - Measurement of the volume in cubic yards will be determined by subtracting the volume of the pipe based on the outside pipe barrel diameter from the volume of the granular backfill calculated by using the pay limits contained above.

See Figure 4 in DIVISION 4 SEWERS for bedding and backfill factors.

204.4.07D PIPE ZONE BACKFILL FOR WATER PIPE

Pipe zone backfill for water lines includes the bedding. Measurement and payment will be made according to the requirements for trench backfill in Subsection 204.4.01C TRENCH EXCAVATION AND BACKFILL. Pipe Zone backfill may be either imported or native, whichever is approved by the Owner's Representative.

204.4.07E TRENCH BACKFILL FOR WATER PIPE

Measurement and payment for trench backfill for water pipe will be made according to the requirements for trench backfill in Subsection 204.4.01C TRENCH EXCAVATION AND BACKFILL. Trench backfill may be either imported or native, whichever is approved by the Owner's Representative.

204.4.08 RIPRAP AND FILTER BLANKET

Approved material for riprap and filter blanket will be measured on a calculated cubic yard compacted, in place basis only when listed in the Proposal as a separate bid item, or when directed by Owner's Representative.

Measurement and payment shall be based on the actual length, width and depth specified or directed by the Owner's Representative. Payment shall include full compensation for over-excavation to allow placement of riprap and filter blanket and all work necessary to place and compact riprap and filter blanket, in place.

When not listed in the Bid, payment for riprap and filter blanket shall be incidental to other items of work.

204.4.09 IMPORTED TOPSOIL

Measurement and payment for imported topsoil will be made on a cubic yard basis only when listed in the Bid as a separate bid item, or when directed by the Owner's Representative to be imported and placed as directed. When not listed in the Bid, payment for imported topsoil shall be incidental to other items of work.

Measurement of the material in the hauling vehicle will be made by the Owner's Representative at the point of delivery. Payment will be made for the actual volume measured. No payment will be made on loads not checked and approved by Owner's Representative.

Payment for imported topsoil shall constitute full compensation for all work necessary to furnish materials on site, placing material and for full compaction in place.

204.4.10 SHORING AND CRIBBING INCIDENTAL

Shoring and cribbing, including all work and materials expended in furnishing, placing and removing such shoring and cribbing necessary to complete the excavation shall be considered incidental to the pay item for excavation.

204.4.11 DEWATERING INCIDENTAL

Dewatering shall be considered as incidental to and included in the pay item for excavation.

204.4.12 PAYMENT

Payment will be made for any or all of the following items when listed as pay items in the Bid for any particular contract.

Pay Item	**Unit of Measure**
Asphalt and Concrete Removal and Replacement	C.Y. or S.Y. or L.F.
Unclassified Excavation	C.Y.
Common Excavation	C.Y.
Concrete Excavation	C.Y.
Rock Excavation	C.Y.
Common Trench Excavation and Native Backfill	C.Y. or L.F.
Common Trench Excavation	C.Y. or L.F.
Borrow Excavation	C.Y.
Embankment	C.Y.
Pipe Bedding Class A for (size) pipe	C.Y. or L.F.
Pipe Bedding Class B for (size) pipe	C.Y. or L.F.
Pipe Bedding Class C for (size) pipe	C.Y. or L.F.
Structural Backfill	C.Y.
Granular Backfill Material	C.Y.
Riprap	C.Y.
Filter Blanket	C.Y.
Imported Topsoil	C.Y.
Sawcutting for Concrete Excavation	L.F.
Pipe Zone Bedding and Backfill, Imported	C.Y.
Pipe Zone Bedding and Backfill, Native	C.Y.
Trench Backfill, Imported	C.Y.
Trench Backfill, Native	C.Y.

Sawcutting, or other approved method of cutting pavement shall be considered incidental to trench excavation and will be done at no additional cost to the Owner.

205 MATERIALS -TYPES AND USE

205.1.00 DESCRIPTION

This section covers certain types of materials and their use that are common to construction work contained in Divisions 3 through 6.

205.2.00 MATERIALS

205.2.01 GENERAL

Unless specified otherwise in the contract documents or Standard Plans, materials contained herein will be used in required work.

205.2.02 PORTLAND CEMENT CONCRETE

Use air-entrained concrete having a design strength, maximum size, minim cement content and slump as set forth in Section 602.3.02 MIX DESIGN.

Use high early strength concrete when patching trenches in Portland cement concrete pavement.

For precast curbs and traffic barriers, use air-entrained Class 4000 - 1 ½ concrete.

Use AASHTO Type II cement in concrete for all sewer and water main construction and appurtenances.

205.2.03 CEMENT MORTAR

Use either standard premixed mortar conforming to ASTM C 387, or mortar proportioned with one part Portland cement to two parts clean, well-graded sand which passes a 1/8 inch screen and which conforms to AASHTO M 45. Admixtures may be used, but do not exceed the following percentages of cement by weight: hydrated lime, 10%, and diatomaceous earth or other inert materials, 5%. Testing shall conform to the OSHD test for mortar strength.

205.2.04 CEMENT GROUT

205.2,04A TYPE "A" GROUT

Utilize grout which consists of one part Portland cement and three parts clean and well-graded sand. Use minimum amount of water to produce a thick, creamy consistency, or as approved by Owner's Representative.

205.2.04B TYPE “B” GROUT

Utilize a mixture consisting of one part Portland cement, 5 parts of clean and well-graded sand, and 7 parts pea gravel, by volume, and a minimum amount of water to produce a thick, creamy consistency, or as approved by Owner's Representative.

205.2.04 TYPE “C" GROUT

When abandoned sewers are to be backfilled with grout, the mixture shall be 1 part Portland cement, 2.5 parts fly ash, 15 parts well graded sand and 1.8 parts water, by weight.

When pea gravel is used, mixture shall be 1 part Portland cement, 2.5 parts fly ash, 11 parts well graded sand, 4 parts of 3/8" pea gravel and 1.8 parts water by weight. Any other mixture must be submitted to and approved by the Owner's Representative.

205.2.04D TYPE "D" GROUT

Non-shrink grout shall meet the requirements of ASTM C1107. Samples shall be molded, cured and tested in accordance with ASTM C-109. Grout shall not exhibit visible bleeding.

205.2.05 STEEL REINFORCEMENT

Use steel deformed bars conforming to ASTM A 615, Grade 60, unless otherwise specified. See Section 603 REINFORCEMENT.

205.2.06 DOWELS

Utilize steel dowels which conform to ASTM A 306 Grade 70. Where specified, dowels shall be coated with plastic or other approved material for bond prevention. See Section 603 REINFORCEMENT.

205.2.07 STRUCTURAL JOINT MATERIAL

Use preformed and poured joint fillers conforming to requirements of Subsection 602.2.06 JOINT MATERIALS. For joints in Portland cement concrete pavement, curbs, gutters, driveways, sidewalks, and pathways, refer to DIVISION 3 -STREETS.

205.2.08 CURING MATERIALS FOR PORTLAND CEMENT CONCRETE

Conform to one or more of the following requirements for curing materials; choice of method to be used is dependent on weather and existing conditions:

1.	White Burlap – Polyethylene Sheets	AASHTO M 171
2.	Waterproof Paper	AASHTO M 171
3.**	White - Pigmented Liquid Membrane – Forming Compound	AASHTO M 148
4.	White Polyethylene Film	AASHTO M 171
5.	Burlap Cloth (Jute or Kenaf)	AASHTO M 182

** Required for PCC curbs, but do not use on bridges or box culverts. Test in accordance with, the OSHD modified procedure.

205.2.09 EPOXY CEMENT

Epoxy cement shall be a two-compound epoxy resin adhesive conforming to requirements of AASHTO M 235.

205.2.10 PORTLAND CEMENT

Furnish one or more of the following types as specified:

- Type I--For general use when special properties of other type cements are not required.
- Type IA--Air-entraining cement for same uses as Type I, where air-entrainment is desired.

- Type II--For use when moderate sulfate resistance or moderate heat of hydration is desired.
- Type IIA--Air-entraining cement for same uses as Type II, where air-entrainment is desired.
- Type III--For use when high early strength is desired.
- Type IIIA--Air-entraining cement for same use as Type III, where air-entrainment is desired.

Portland cement shall conform to AASHTO M 85 for low alkali cement except as follows:

1. 1.Total alkali content (sodium and potassium oxide calculated as Na_2O+O.658K_20) shall not exceed 0.8 percent.

2. Types I, IA, III or IIIA must contain a maximum of 10 percent tricalcium aluminate.

3. Time-of-setting tests shall be by either the Gillmore Test or the Vicat Test or both, as Owner's Representative may elect.

When not otherwise specified, use Type I. Contractor, at his option, may use Type III Portland cement (high early strength) in lieu of Type I in the identical quantity specified for the latter. Differing brands or types of cement, or the same brand or type of cement from different plants must not be mixed during use nor be used alternately without prior written approval. Cement may be sampled either at the plant or site of work at option of Owner's Representative.

205.2.11 WATER

Water used in all work must be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product. Use water conforming to AASHTO T 26 for mixing and curing Portland cement concrete, mortar or grout. Water of approved potable quality may be used without test.

205.2.12 AGGREGATES

205.2.12A GENERAL

Aggregates shall be subject to approval at the source or at the actual stockpile from which the aggregate is taken for incorporation in the work. During production of the aggregate, provide samples of each size for testing if required by Owner's Representative. On the basis of testing, modify or adjust crushing and screening operations to bring each separate size of aggregate within gradings, proportions, and quantities as specified.

In all stages of production, transporting, and stockpiling, handle aggregates in such a manner as will prevent the segregation of materials and the intermingling of separate gradings or kinds of aggregates, as far as practicable.

Grading of designated aggregate sizes shall conform to the requirements 'of appropriate forms of work contained within applicable sections throughout these specifications.

The determination of sizes and grading of aggregate shall conform to AASHTO T 27 and AASHTO T 11.

205.2.12B COARSE AGGREGATES

Coarse aggregate shall be natural or crushed rock or gravel which is retained on a No. 4 sieve and reasonably free from flat, elongated, soft or disintegrated pieces, vegetable material, or other deleterious matter occurring in a free state or as a coating on the stone.

Use crushed rock or crushed gravel for coarse aggregate in aggregate bases and all asphalt construction requiring coarse aggregate. Total deleterious matter shall not exceed 2 percent by weight.

Use crushed rock, natural gravel, or other approved inert materials of similar characteristics, or combinations thereof, for coarse aggregate in Portland cement concrete. Do not allow amount of deleterious substances in Portland cement concrete to exceed the following amounts:

Lightweight pieces	0.25% (by weight)
Friable particles	0.25% (by weight)
Material passing No. 200 sieve	1.00% (by weight)
Wood waste	0.05% (by weight)

Use coarse aggregates having weighted percentages of loss which do not exceed 12 percent by weight when subjected to five alterations of the sodium sulfate soundness test (AASHTO T 104).

Fracture of Gravel

When crushed gravel is furnished, it shall have at least one mechanically fractured face on not less than the following percentages (by weight) of the material retained on a 1/4" sieve.

Type of Use	**Percentages**
Asphalt Concrete Pavement (Division 3)	75
Asphalt Surface Treatment (Division 3)	90
Asphalt Treated Bases (Division 3)	65
Portland cement concrete (Division 6)	60
Aggregate Bases (Division 3)	
1 1/2"-0" and larger	50
Smaller than 1 1/2" - 0"	70

Durability

The source material from which coarse aggregate is produced shall meet the following qualifying test requirements:

Test	**Test Method**	**Requirements**
Degradation:		
Passing No. 20 sieve	OSHD Standard	30% Max.
Sediment Height	OSHD Standard	3" Max.
Abrasion	AASHTO T 96	30% Max.

Also, other sampling and testing of coarse aggregate shall be in accordance with the following methods:

Sampling	AASHTO T 2
Materials Passing No. 200 sieve	AASHTO T 11
Sieve Analysis	AASHTO T 27
Soundness	AASHTO T 104
Friable Particles	AASHTO T 112
Lightweight Pieces	AASHTO T 113
Fracture	OSHD Standard

205.2.12C FINE AGGREGATE

Use fine aggregate consisting of finely crushed rock or gravel, fine sand, and other finely divided natural and inert mineral matter, thoroughly washed, and reasonably free of clay, loam, shale, alkali, vegetable matter and other deleterious matter occurring either free or as a coating on the particles. Do not mix fine aggregate from different geological sources, and do not store in the same pile nor use alternately in the same class of construction or mix.

Portland cement concrete shall contain fine aggregate which has a deleterious material content not exceeding the following limits:

Friable Particles	1% (by weight)
Lightweight Particles	1% (by weight)
Material Passing No. 200 sieve	4% (by weight)

When this-fine aggregate for Portland cement concrete is subject to five alternations of the sodium sulfate soundness test (AASHTO T 104), weighted percentage of loss must not exceed 10 percent by weight.

Asphalt cement concrete and surface treatments shall contain fine aggregate having a weighted loss of not more than 15 mass percent when sodium sulfate is used or 20 mass percent when magnesium sulfate is used in five cycles of the soundness test. Total deleterious matter shall not exceed 2 percent by weight. Use fine aggregates which meet the durability requirements for coarse aggregates contained above, and which meet the following Liquid Limit and Plasticity Index requirements:

Quality	**Test Method**	**Requirement**
Liquid Limit	AASHTO T 89	MP or 33 Max. *
Plasticity Index	AASHTO T 90	NP or 6 Max. *

*When tested as specified, both the liquid limit and plasticity index test results shall conform to the following:

Percent of Material Passing No. 40 Sieve	**Liquid Limit (Maximum)** AASHTO T 89	**Plasticity Index (Maximum)** AASHTO T 90
0.0 to 5.0, inclusive	33	6
5.1 to 10.0, inclusive	30	5
10.1 to 15.0, inclusive	27	4
15.1 to 20.0, inclusive	24	3
20.1 to 25.0, inclusive	21	2
Over 25.0	21	0 or N.P.

Sampling and testing fine aggregate shall conform to the following methods:

1. Sampling	AASHTO T 2
2. Material Passing No. 200 sieve	AASHTO T 11
3. Organic Impurities	AASHTO T 21
4. Sieve Analysis	AASHTO T 27
5. Mortar Strength	OSHD Standard Test **
6. Soundness	AASHTO T 104
7. Friable Particles	AASHTO T 112
8. Lightweight Pieces	AASHTO T 113
9. Sand Equivalent	OSHD Standard Test **

**Available from Engineer of Materials, ODOT, Salem, Oregon 97310.

205.2.12D RECYCLED AGGREGATES

Recycled aggregates shall be a mixture of natural or crushed rock or gravel, crushed concrete, and crushed or ground asphaltic concrete. The material shall be completely comprised of the product of the crushing operation without the addition of soil or foreign binders. The proportion of recycled aggregate obtained from asphaltic concrete shall not exceed 60% by weight of the material retained on the No. 4 sieve. The material shall be free of flat, elongated, soft or friable pieces. Deleterious materials including vegetative matter, wood, lightweight pieces, insulation, gypsum, glass, metal, and particles passing the No. 200 sieve shall not exceed 2% by weight. A minimum of 70 percent by weight of the particles retained on the 1/4" sieve shall have at least one fractured face. Durability requirements and methods for sampling and testing of recycled aggregates shall be as described for coarse aggregates in Section 205.2.12 COARSE AGGREGATES.

205.2.13 ASPHALT MATERIALS

205.2.13A GENERAL

Unless otherwise specified herein or in applicable subsections, types and grades of material shall conform to the current Oregon State Highway Division's "Specifications for Asphalt Materials" obtainable from the Engineer of Materials, ODOT, Salem, Oregon 97310.

205.2.13B ASPHALTIC CONCRETE

Hot Mix -use PBA-2, 4 or 5 asphalt cement as recommended for the Pacific Coast States.

Recycled Asphalt Paving -use PBA-2, 4 or 5 asphalt cement recommended for the Pacific Coast States.

Cold Mix -use MC 250 Liquid asphalt, CMS-2. CMS-2S or CSS-1.

205.2.13C PRIME COAT

Use MC 250 liquid asphalt, CMS-2S or CSS-1.

205.2.13D SEAL COAT

Use CRS-2 cationic emulsified asphalt.

205.2.13E TACK COAT

Use AR 4000 or AC-20 asphalt cement, or CS S-I emulsified asphalt.

205.2.13F SLURRY SEAL

Use CRS-lH or CSS-lH emulsified asphalt.

205.2.14 GEOTEXTILE FABRICS

Use fabric composed of strong rotproof polymeric fibers oriented into a stable network such that the fibers retain their relative positions with respect to each other. The fabric shall be free of any chemical treatment or coating which could significantly reduce permeability, and shall have no flaws or defects which could significantly alter its properties. The following physical property requirements shall be met for fabrics used in the following applications.

The fabric manufacturer shall furnish a certificate or affidavit attesting that the fabric meets all the requirements stated in these specifications.

Specifications of fabric for uses indicated:

(A) Trench: Non-woven Polypropylene
Water Permeability (k).....0.01 cm/sec min.
Equivalent Opening Size (U.S. Standard Sieve).....70-100
Grab Strength (ASTM D 4632.....90 lbs. min
Grab Elongation (ASTM D4632) .....50% min.
Weight.....40 oz/sy min

(B) Subgrade/stabilization: Non-woven Medium Needled Polypropolene or Slit Film Woven Polypropylene

Puncture Strength (ASTM D 751) .....75 lbs. min.
Grab Strength (ASTM D4632).....100 lbs. min.
Burst Strength (ASTM D 751) .....250 psi min.
Weight.....4 oz/sy min.

(C) Asphalt Overlay: Non-woven Polypropylene

Grab Strength D4632.....90 lbs. min.
Elongation.....50-150%
Asphalt Retention.....0.5 - 8.5 oz/sf
Fabric Shrinkage.....∀ 15% max.

205.3.00 CONSTRUCTION

205.3.01 GENERAL

Conform to construction requirements contained in the specific section within these specifications which is applicable to the type of work specified. See Section 309 GEOTEXTILE FABRICS.

205.4.00 MEASUREMENT AND PAYMENT

Measurement and payment of materials will conform to the specific section within these specifications which is applicable to the type of work specified. See Section 309 GEOTEXTILE FABRICS.

206 ADJUSTMENT OF INCIDENTAL STRUCTURES TO GRADE

206.1.00 DESCRIPTION

This section covers the work necessary for adjusting tops of manholes, sumps, catch basins, inlets, valve boxes, meter boxes, monument boxes and similar structures to required elevation and/or horizontal alignment, complete.

206.2.00 MATERIALS

206.2.01 GENERAL

Materials used in adjustment of incidental structures may be materials salvaged from the existing installation and brought to a condition approved for reuse, or materials conforming to the requirements of related work referred to herein or elsewhere in the applicable divisions.

206.3.00 CONSTRUCTION

206.3.01 EXCAVATION AND BACKFILL

Excavation shall be unclassified and shall include whatever materials are encountered to the depths as shown or as directed.

Saw cut around structure to be adjusted when new concrete pavement has been completed. Do not jackhammer for concrete pavement cutting. Replace pavement to previous density and grade.

Backfill shall be done in accordance with the applicable requirements of Section 204 EXCAVATION, EMBANKMENT, BEDDING AND BACKFILL.

206.3.02 SALVAGE OF FRAMES, COVERS, GRATES AND FITTINGS

Metal frames, covers, grates and fittings may be salvaged from structures to be adjusted, and if of suitable size and condition, may be reused in the work. Those which are damaged or which are unfit for reuse, as determined by Owner's Representative, shall be replaced with similar items which are comparable in all respects and which are adequate for the intended purpose.

Salvaged components to be reused shall be cleaned of foreign material by solvents, sand blasting or other approved methods that will not harm the component but will restore it to a nearly new condition, as approved. Salvaged frames, covers, grates and fittings not reused on the project shall become the property of the Owner and delivered to the Bureau of Maintenance, Stanton Yard, 2835 N. Kirby Avenue. No separate payment will be made for the salvaging and delivering the frames, covers, grates, and fittings, it being incidental to the work.

206.3.03 RAISING TOPS OF MASONRY STRUCTURES

After existing frames, covers and grates have been removed, exposed top surface on which new mortar or concrete is to be placed shall be chipped away to a depth of at least 1/4inch to expose firm concrete and the new surface shall be cleaned by brushing and shall be moistened with water at the time of placing new concrete thereon. New concrete shall then be placed to required grade and cured at least three days, after which the frame shall be seated in fresh mortar and brought to proper grade. Masonry of bricks or concrete blocks shall be raised with new bricks, blocks, mortar or combinations thereof or with Portland cement concrete, as conditions may require or permit. Concrete boxes may be lifted and placed on precast concrete box extensions, on new brick or on cast-in-place concrete as may be suitable.

Mortar for building up existing masonry shall be placed to a depth of not more than two inches. Concrete shall be placed to a depth of not less than 3 1/2 inches. To conform to these requirements, existing shells or walls of structures to be raised shall be cut down as necessary to provide space for the new construction.

Fabricated metal rings or plates may be furnished and used in adjustment work, provided the metal and its fabrication design is at least equal to pertinent characteristics of strength and support required of the covers or grates to be placed, that uniform bearing on bearing surfaces is assured, and adequate measures are taken to assure no displacement occurs when in service. Design must be approved by Owner's Representative, and lab inspection shall be required by Owner.

206.3.04 LOWERING TOPS OF MASONRY STRUCTURES

Where the top of an existing masonry structure is to be lowered, the masonry portion of the structure shall be exposed to required depth, cut off or removed to an elevation below that established for the bottom of metal frame or cover which is to be reset on masonry and shall then be built up with mortar, concrete, brick or concrete blocks, or with metal rings or plates to required elevation and top design. Joining of new material to old, minimum thicknesses of new mortar and concrete, limitations, curing and other details shall be as set forth above.

206.3.05 ADJUSTI NG METAL STRUCTURES

Metal inlets, valve boxes, meter boxes, monument boxes and other like structures**,** shall under normal conditions, be raised or lowered to grade by resetting the entire structure on firm foundation. In the case of raising the structure to a point where it would not enclose or protect its contents, add metal extensions of like design below the original structure. Contractor may replace the structure with a new structure of adequate design as approved. Salvaged structures not reused on the project shall become the property of Owner.

206.3.06 ADJUSTING MANHOLES, CATCH BASINS AND SIMILAR STRUCTURES

Conform to applicable Sections of DIVISION 4 -SEWERS.

206.4.00 MEASUREMENT AND PAYMENT

206.4.01 MEASUREMENT AND PAYMENT INCIDENT

When no pay item is listed in the Bid, all work will be considered as incidental to the other pay items and no separate payment will be made.

206A.02 MEASUREMENT AS UNITS IN PLACE

When listed in the Bid, measurement will be the actual number of manholes, sumps, catch basins, inlets, valve boxes, meter boxes, monument boxes and other like structures adjusted under this Section, measured as units in place completed and accepted. Separate measurement will be made of each specific type or of each separate grouping of types of structures for which separate items are shown in the Bid. Required earthwork, backfill, replacement of base drains, stone bases, pavements, and other miscellaneous work will be considered as incidental to the adjusting work and no separate measurements will be made.

206.4.03 PAYMENT AS UNITS IN PLACE

When listed in the Bid, the accepted units in place will be paid for at the applicable contract unit price per each for the particular pay items listed below and shown in the Bid.

Pay Item	**Unit of Measurement**
Adjusting Manholes	Each
Reconstructing Concrete Manholes	Each
Adjusting Inlets	Each
Adjusting Boxes	Each

Items 1 and 2 refer to manholes, sumps and like structures designed to permit human entry and working space inside and to confine and control and flow of pipe-conveyed liquids. These structures are collectively referred to as manholes.

Item 1 applies to manholes, regardless of composition, design, type or depth.

Item 2 refers to monolithic concrete manholes which, in having their tops adjusted have necessarily had their entire existing domes destroyed and new domes constructed, or had their entire existing top slabs destroyed and new slabs constructed, or precast manholes which have adjustments made below the cone.

Item 3 refers to inlets and catch basins that are structures designed to receive surface water through grates and orifices and to discharge water into pipes.

Item 4 refers to valve boxes, meter boxes, monument boxes and other like structures, which are comprised of a box-like body and removable cover provided for the protection of and access to meters, valves, markers, monuments, shut-offs, and similar items. If a protective coating is required on the new metal used in the work, the coating shall be provided as an incidental item without separate or additional compensation.

207 LANDSCAPING

207.1.00 DESCRIPTION

This section covers the work necessary for: (A) finish grading, addition of topsoil, fertilizer and weed control, establishment of lawns or grass areas by sod or seeding, and maintenance of lawn or grass areas, complete; (B) mulching, fertilization and planting of ground cover, establishment of nursery stock, such as trees, shrubs, and small plants and maintenance of ground cover and nursery stock, complete; (C) irrigation system and subsurface drainage, complete.

207.2.00 MATERIALS

207.2.01 PLANTS

Names of plants conform to the latest edition of "Standardized Plant Names" of the American Joint Committee on Horticultural Nomenclature. Names of varieties not included therein conform to names generally accepted in the nursery trade.

Furnish plants that are healthy first-class representatives of their species or variety, free from disease and insect pests. The top growth shall be well-developed, free of disfiguring knots, sun scalds, bark abrasions, wind or frost injury or any other objectionable features. All plants shall be nursery grown, unless otherwise shown or specified.

Furnish plants that conform to the applicable requirements in the current issue of "American Standard for Nursery Stock", published by the American Association of Nurserymen. When a conflict exists between the above publication and the specifications, the specifications will prevail.

Protect plants at all times during handling, shipping, storage, and planting. Protect plants during transit, from windburn, extreme weather conditions, and drying of roots or rootballs.

(a) Trees -Each tree shall possess top and root growth typical to the variety. Trees with central leaders shall have a straight trunk and be well branched and symmetrical. Trees having a damaged or missing leader, multiple leaders or Y-crotches will be rejected. Sheared conifer trees will be rejected.

(b) Shrubs -Shrubs shall be well-formed and possess the top and new growth typical to the variety.

(c) Container-Grown Plants -Plants shall have been transplanted into a container long enough for new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container. Container-grown plant material which is rootbound will be rejected. Furnish vines and ground cover plants in individual containers unless otherwise specified.

(d) Collected Plants -Collected plants, if permitted or specified for use, shall conform to all appropriate quality, grade and class requirements of the current issue of the "American Standard for Nursery Stock".

207.2.01A LABELING AND PROTECTION

Provide a state inspection certificate for all plant materials. In addition, provide a shipping certificate for each load or lot of plant material that contains the following information:

1. Date of shipment.
2. Name of nursery where grown.
3. Name of plants. (Including all names as specified in the contract.)
4. Number of plants.
5. Grade of plants. (Verifying that plants conform to the specifications).
6. Size. (Height, runner length, caliper, etc., as required.)

Provide labels showing the plant's horticultural name as follows:

1. On at least one plant in a group of the same species.
2. On each plant of individual species plantings.
3. Remove labels before final inspection.

207.2.01B INSPECTION OF PLANTS

Plants shall be subject to inspection at any place and time. The City will make no inspection of the plant material at the source except as it may elect.

Plants will be inspected after arrival at the project and before planting. Do not plant materials until such inspection is made. The presence of noxious weeds in the soil accompanying plants or at the nursery source shall be cause for rejection of any or all plants from that source. Replace plants not conforming to the specifications with specified plants at the Contractor's expense. Approval of plants for a project, either at the source or before planting and final inspection shall not be considered as final acceptance.

207.2,01C SUBSTITUTION OF PLANTS

Furnish a list of nursery sources for specified plants within 30 calendar days after the execution of the contract. This list shall verify that all specified plant material has been located and is available for use on the project. No substitution of plant materials will be permitted unless written evidence is submitted that a specified plant cannot be obtained and has been unobtainable since the execution of the contract. If substitution is permitted, it will be by written approval of the nearest acceptable variety, size and grade.

207.2.02 SEED

Provide tested grass or legume seed from blue tag stock and from the latest crop available. Deliver each variety or mixture in standard containers labeled in accordance with Oregon State laws and U.S. Department of Agriculture rules and regulations under the Federal Seed Act. Provide with label showing the following: seed variety, percentage of purity, germination, maximum weed content, date of test (must be within9 months of date of delivery). Seed must be tested as set forth in the General Seed Certification Standard by the Oregon State University Certification Board. Mold or evidence of container having been wet or otherwise damaged will be cause for rejection of each lot of seed. Reject seed that is not labeled or that does not conform to specifications, replace at the providers expense.

Unless otherwise specified, grass seed should consist of a blend of 2 different varieties of perennial rye grass and 1 variety of hard fescue grass seed. Seed mixture should be no less than 50% Perxauiac rye grass, 50% hard fescue, with a tolerance of 1.98% inert matter, 0.00% other crop seed and 0.00% weed seed.

207.2.03 SOD

Provide grass sod from certified or approved source, strongly rooted and free of weeds, diseases, nematodes and insects. Sod shall be mature and not less than 10 months old. Sod should be composed of several seed varieties excluding blue and bent grass varieties or as specified in special provisions.

207.2.04 TOPSOIL

207.2.04A NATIVE TOPSOIL

Save, store, protect and reuse approved native topsoil taken from the top 12 inches of the excavation. Ensure that topsoil is free from grass, overburden and roots, sticks, hard clay, and any stones which will not pass a 1 inch square opening and noxious weeds or other plants designated as noxious weeds by state or county officials. Wherever native topsoil cannot be saved or is not satisfactory for reuse, use imported topsoil conforming to Subsection 207.2.04B IMPORTED TOPSOIL, but only with the approval of Owner's Representative.

207.2.04B IMPORTED TOPSOIL

Where imported topsoil is specified in the Contract Documents, provide natural, fertile, friable, loamy topsoil, representative of local productive soil. Soil must be free from substances toxic to plant growth. Soil must not be frozen or muddy. Soil will have a pH 5.0 to 7.0, and not less than 3 percent humus as determined by loss on ignition of moisture-free samples dried at 100 degrees C. Imported topsoil shall be free of refuse, sticks, or other debris that when tested according to AASHTO T 88 conforms to the following:

Sieve Analysis Particle Size Range	**Percent by Weight**
Larger than 2"	0
2" - 0.75	0-5
0.75 - 0.187" (No. 4 sieve)	0-20

Of the fraction passing the No. 4 sieve, excluding organic material, the topsoil shall conform to the following limits:

Hydrometer Analysis Particle Size Range	**Percent by Weight**
0.187" - 0.003" (sand)	5-70
0.003 - 0.00008" (silt)	20-80
Less than 0.00008" (clay)	5-30

Imported topsoil shall be free of quack grass, horsetail, nutsedge, morning glory and other noxious vegetation and seed as designated by authorized State or County officials. Should such regenerative material be present in the soil all resultant growth, both surface and root, shall be removed by Contractor within one year of acceptance of the work at no expense to Owner.

Furnish topsoil material from sources of suitable material, defined as follows:

Each source shall be well drained and, before stripping, shall have healthy crops of grass or other vegetative growth, free from noxious weeds such as Canadian thistle, morning-glory, blackberry, horsetail, tansy ragwort or other plants designated as a noxious weed by authorized State or County officials. Remove and dispose of all heavy grass or other vegetation before taking materials from the source. Ordinary sods do not need to be removed from the topsoil, however, thoroughly break up and intermix with the soil.

Twenty days before furnishing topsoil from a source:

1. Give the Owner's Representative notice of intent to use the source.
2. Provide a 20-pound representative sampling for testing.
3. Provide access to the source for inspection.

Obtain approval of the source before excavation of topsoil begins. When excavating topsoil, provide the most suitable material from the sources. Prevent fouling of suitable material with subsoil of other extraneous matter.

Perform hauling and spreading without damaging surrounding objects and without subjecting the topsoil and the areas on which it is placed to compaction. Protect from damage roadways, shoulders, curbs, walks or other structures and areas which must be traveled, crossed or mounted.

Accurately and smoothly spread the topsoil over the specified areas to the thickness, grades, and slopes shown or directed. Deposit and spread the material so that compaction of the material, as far as practical, is prevented. Do not place the material during wet conditions which would tend to cause compacting of the material.

Avoid wasting topsoil material. Material placed contrary to the Owner's Representative's instructions or where not designated will not be paid for.

Finish areas covered with topsoil to proper grade, contour and cross section. Cultivate all topsoil not in a loose and friable condition to a depth of at least 4 inches. Bring the surface to a condition ready for fertilizing, seeding or planting operations.

207.2.05 SAND

Conform to requirements of Subsection 205.2.12C FINE AGGREGATE.

207.2.06 SOIL CONDITIONERS

Soil conditioners are for modifying soil structure, as distinguished from plant foods and mulch. Soil conditioner shall be approved by the Owner's Representative and be free of noxious weeds, and substances detrimental to plant life.

Provide soil conditioners from one of the following:

1. Spent mushroom growing compost.
2. Processed and composted mint plant residue (mint manure).
3. Peat moss.
4. Well-rotted pea vines.
5. An approved, commercially manufactured, soil conditioner made from composted sewage sludge amended with organic and inorganic materials.
6. An approved, commercially manufactured, soil conditioner made from composted yard debris, amended with inorganic materials.

207.2.07 LIME

Provide a lime composed of ground dolomitic limestone not less than 85 percent total carbonates and magnesium, ground so that 50 percent passes 100 mesh sieve and 90 percent passes 20 mesh sieve. Coarser material may be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing 100 mesh sieve.

207.2.08 . SUBDRAINS

Use perforated drain pipe, PVC or ABS, meeting requirements of Subsections 402.2.06 ABS PIPE or 402.2.07 POLYVINYLCHLORIDE PIPE, unless otherwise specified, and as approved by Owner's Representative.

207.2.09 IRRIGATION AND WATERING SYSTEMS

207.2.09A PIPE

Use galvanized steel pipe and fittings, standard weight threaded pipe, conforming to requirements of ASTM A 120, and joint compounds of recognized standards acceptable to the Owner's Plumbing Division, Bureau of Buildings.

Use copper pipe, Type K hard copper, conforming to ASTM B 88, with commercially pure wrought copper solder joint fittings. Make joints with 95-5 wire solder, ASTM B 32, grade 95 TA. The use of cored solder will not be permitted.

When using PVC pipe (SDR-PR), conform to ASTM D 2241, and use fittings of PVC with deep socket dimensions conforming to ASTM D 2466.

207.2,09B GATE VALVES

Install the following gate valves: Up to and including 3-inch with bronze bodies, 4 inch and larger with either bronze or iron bodies, all having bronze stems, bronze seat rings, and bronze disc faces and conforming to ASTM B 62.

207.2.09C PRESSURE REDUCING VALVES

Use adjustable, heavy duty bronze pressure reducing valves. Must have approved stainless steel or monel strainer to permit quick cleaning or replacement without dismantling or removing the valve from the line and with integral or independent union.

207.2.09D CONTROL VALVES

Provide manual control valves of brass or bronze for underground installation. Valves will have cross or slot type handle for operation with a standard key, a removable bonnet and stem assembly, an adjustable packing gland, a rising stem to assure full opening of valve, renewable disc-type washer seat, and integral or independent union.

Use electrically operated control valves of bronze, brass or stainless steel. These will be of the normally closed type, having an open or close time greater than 4 seconds, and capable of manual control during power failure. Provide with a motor assembly or operating parts which are removable without disturbing the valve body. Must be all waterproof for underground burial, and with integral or independent union for supply line connection.

207.2.09E QUICK-COUPLING VALVES

Supply one-piece or two-piece body type, locking cap, having body of approved heavy duty brass or bronze, watertight before and after the coupler is inserted, and designed so that the valve seat is closed before the coupler is removed. Provide valve couplers, keys, and hose swivels of compatible design to quick-coupling valves.

207.2,09F RISERS

Connect sprinkler heads and quick-coupling valves to galvanized steel pipe water supply lines with galvanized steel pipe risers. Heads and valves connected to plastic pipe water supply lines shall, in addition, be provided with an approved swing joint.

207.2.09G VACUUM BREAKERS

Install bronze-bodied machined valve seat, with working pressure rating to 150 psi. Provide pressure type vacuum breaker as an assembly consisting of vacuum breaker, 2 gate valves, check valve union, and nipples, as approved.

207.2,09H BACKFLOW PREVENTERS

Use either reduced pressure or double check valve assemblies, as indicated in Contract Documents, of a type and size approved by the Owner's Plumbing Division, Bureau of Buildings.

207.2.10 FERTILIZER

Use fertilizer conforming to the recommended content as provided for in Subsection 207.3.02 SOIL TEST. Furnish fertilizer in moisture-proof bags with weight and the manufacturer's certified analysis of the contents showing the percentage for each ingredient. Furnish fertilizer in a dry condition free from lumps and caking, in a uniform granular or pelletized form, of standard commercial grade conforming to all State and Federal regulations and to the standards of the Association of Official Agricultural Chemists. Fertilizer may be furnished in bulk form if an approved transfer hopper is provided.

Apply fertilizer as shown, specified or directed.

207.2.11 MULCH AND GROUND COVERS

Provide mulch materials free of noxious weed seeds and plants and which contain no substance detrimental to plant life. The kind of mulch material(s) acceptable for use will be as shown, specified, or approved.

1. Wood or Grass Straw Cellulose Fiber -Process the wood or straw mulch so that the fibers remain uniformly suspended under agitation in water. Blend the mulch with seed, fertilizer and other typical additives of a hydroseeding mixture to form a homogeneous slurry.

   The processed mulch shall have the ability to cover and hold grass seed in contact with soil. The wood or grass straw fiber shall have moisture-absorption and percolation properties to form a blotter-like ground cover. Color the cellulose fiber green to visibly aid uniform application.

   Ship wood or grass straw cellulose fiber in packages of uniform weight (+/-5%) and labeled with the manufacturer's name and air-dry weight.

2. Grass Straw -Straw mulch for non-hydroseeding applications shall be grass straw from bentgrass, bluegrass, fescue or ryegrass, singly or in combination. The straw shall not be moldy, caked, decayed or of otherwise low quality. Use a straw binder or tackifier if specified.

3. Peat Moss -Peat moss shall be horticultural grade natural peat moss in air-dry condition and free from woody substances. Furnish peat moss in bales or bags labeled for contents and volume.

4. Sawdust -Sawdust shall be free of chips, splinters, and strips.

5. Bark -Bark mulch shall be ground, shredded or broken particles from the bark of fir, pine, or hemlock trees and free of harmful bacteria, disease spores, pests and substances toxic to plant growth.

The mulch shall be the standard trade size known as "medium bark mulch". Submit a 15-pound sample to the Owner's Representative for visual inspection and approval at least 7 calendar days before delivery to the project. The approved sample will be used as reference for acceptability of material used in the work.

207.2.12 EROSION CONTROL MATTING

1. Jute matting -Jute matting shall consist of a uniform, open, plain weave of single jute yarn. The yarn shall be of loosely-twisted construction and shall not vary in thickness by more than one-half of its normal diameter. The weave shall provide openings of about 1 square inch.

   Furnish the matting in widths of 45 inches or more, continuous lengths of not less than 150 feet, and weigh not less than 0.9 pounds per square yard.

   Use staples of 12 gauge or heavier steel wire which is bent to a U-shape 2 inches wide. Staples shall not be less than 10 inches long unless the Owner's Representative allows a shorter length for hardpan soil conditions.

2. Excelsior Matting -Excelsior matting shall consist of a machine-produced blanket of curled-wood fibers, of which 80% are 6 inches or longer. Furnish a blanket of uniform thickness, with the fiber evenly distributed over the entire area of the mat.

   Cover the topside of the matting with maximum 3" x 3" size mesh of high wet strength, twisted kraft paper, or a maximum 2" x 2" biodegradable, extended plastic mesh. Make the matting smolder-resistant without the use of chemical additives.

   Excelsior matting shall have a minimum dry weight of 0.8 pound per square yard (+/10%). Furnish in minimum 36-inch wide rolls.

   Wire staples for excelsior matting shall be the same as specified for jute matting.

3. Alternate Matting Material -Submit any proposed alternate material with specifications, costs, and manufacturer's literature to the Owner's Representative for consideration. Alternate material may be used only if allowed.

207.2.13 SOIL STERILANT

Soil sterilant shall be as approved by Owner's Representative for purpose specified and shall be applied following manufacturer's recommendations.

207.3.00 CONSTRUCTION

207.3.01 GENERAL

Conform to Manufacturer's and supplier's recommendations and instructions and to accepted practices in the industry.

207.3.02 SOIL TEST

If directed by Owner's Representative, have a soil test performed before the project schedule is submitted. The test may be performed by any Oregon State University County Extension Agent or by any other approved soils testing laboratory. The soils analysis shall provide a chemical analysis of the soil and recommendations shall be used to select the particular fertilizer and soil improvement materials to be used prior to planting.

207.3.03 EROSION CONTROL SEEDING

This work consists of preparing, fertilizing, seeding, and mulching to develop grass growth for erosion control on medians, interchanges, cut and fill slopes, areas disturbed by project construction, mandatory material sources or disposal areas and where specified or directed. Excluded are rock slopes and areas under water for considerable periods of time.

207.3,03A MATERIALS

Materials shall meet the following requirements:

Erosion Control Matting 207.2.12
Fertilizers 207.2.10
Mulch Materials 207.2.11
Seed 207.2.02

207.3.03B PLANTING SEASONS

Unless otherwise specified or approved, perform this work during either the spring season, between February 1 and May 15, or the fall season, between August 1 and November 15.

Perform the work only when local weather and other conditions are favorable to seeding and mulching. Do not undertake the work when wind velocities would prevent uniform application of materials or would drift materials.

Seed, fertilize, and mulch in stages along the project as soon as practical after completing earthwork.

207.3.03C PREPARATION OF AREAS

Finish all earthwork before seeding. Restore areas which are misshapen or eroded before seeding.

Remove rocks, weeds, debris and other matter detrimental or toxic to the growth of grass from areas to be seeded. If topsoil is added to these areas, cultivate existing ground surface to a depth of 4 to 6 inches before placing topsoil. Remove all loose stones larger than 2 inches, on 3:1 or flatter slopes.

Do not damage existing vegetation that is to be left in place.

On areas to be seeded prepare surface soil to a condition favorable for germination of seed and growth of grass. Maintain at least 1/2 inch of surface soil in a loose condition.

Conduct surface preparation operations along the contours of areas involved. On roadbed cut and fill slopes, form minor ridges and irregularities to retard erosion and improve germination.

207.3.03D FERTILIZING AND SEEDING

Uniformly apply seed and fertilizer at the rates indicated by the special provisions.

Thoroughly mix seed when more than one kind of seed is to be used. Seed and fertilizer may be combined in water for application by hydraulic means. When fertilizer and seed are to be applied in dry conditions, apply them separately. If applied from separate compartments, the application may be done in one operation.

Place seed and fertilizer before placing mulch, except fertilizer and seed may be applied after mulching:

If the mulch is punched into soil by mechanized means.

If it is necessary to hold down mulch with netting or like material.

On ½:1 or steeper slopes where a slurry mixture would tend to run down the slope.

Prevent seed and fertilizer from falling or drifting onto areas occupied by rock base, rock shoulders, plant beds or other areas where grass is detrimental.

207.3.03E APPLICATION OF SEED AND FERTILIZER

Apply seed and fertilizer by one of the following kinds of equipment as the Contractor elects, subject to limitations under Subsection 207.3.03F WORK QUALITY.

1. Grass seed drills or seeders which work fertilizer into the soil and place the seed under about a ¼ inch soil cover.

2. Hydraulic equipment which continuously mixes and agitates the slurry and applies the mixture uniformly through a pressure-spray system providing a continuous, nonfluctuating delivery. Apply the materials using a sweeping horizontal motion of the nozzle.

   Add a nontoxic tracer to the seed and fertilizer mixture to visibly aid uniform application. Do not exceed 250 pounds per acre when wood cellulose fiber is used as a tracer.

3. Blower equipment using air pressure and an adjustable spout that uniformly applies dry fertilizer and dry seed in separate and successive applications at constant measured rates. Apply the materials using a sweeping, horizontal motion of the spout.

4. Helicopter equipped with hoppers and adjustable disseminating mechanisms that separately and successively apply dry fertilizer and dry seed in uniform and prescribed quantities. If provided in the special provisions, liquid fertilizer may be used.

5. Hand-operated mechanical spreaders that uniformly apply dry fertilizer and dry seed separately and successively in prescribed quantities.

207.3.03F WORK QUALITY

Regardless of equipment and methods used, prevent drift and displacement of seed and fertilizer. If equipment and methods of application results in wasting material, make corrections as directed.

Do not disturb areas previously completed. If areas are disturbed, re-treat as directed, at Contractor's expense.

Notify the Owner's Representative at least 2 calendar days in advance of starting operations, and keep the Owner's Representative advised of the operations.

207.3.03G MULCHING

Evenly apply mulch material according to these provisions and the special provisions with 48 hours after seeding and fertilizing.

Place mulch after seeding and fertilizing, except for conditions allowing seed applied on mulch according to Subsection 207.3.03D FERTILIZING AND SEEDING.

Replace any material that becomes displaced before acceptance of the work.

Mulch areas not accessible to heavy equipment by approved methods. Place mulch materials according to the following:

1. Place grass straw mulch to a reasonably uniform thickness of 1 1/2 to 2 1/2 inches, and average approximately 2 inches in loose condition. This rate requires between 2 and 3 tons of dry mulch per acre. The grass straw mulch shall be loose enough for sunlight to penetrate and air to circulate; but dense enough to shade the ground, reduce water evaporation, and materially reduce soil erosion. Retain grass straw mulch in place according to the special provisions.

2. Place waterborne wood cellulose fiber material, where fibers are uniformly suspended in water, to seeded areas using hydraulic pressure equipment. Unless otherwise specified apply at least 2,000 pound per acre, based on dry fiber weight.

Prevent damage to prepared areas and to fertilizer, seed and mulch in place.

Remove mulch material which falls on plants, roadways, gravel shoulders, structures, areas where mulching is not specified, or which collects at the ends of culverts or accumulates to excessive depths, as directed.

If tacking agents are used with mulch, use protective covering on structures and objects where coverage and stains would be objectionable. Protect vehicles and persons from drifting spray.

207.3.03H PLACEMENT OF EROSION CONTROL MATTING

Place jute or excelsior matting flat in single thickness strips paralleling the direction of probably water flow. Lap multiple strips of jute matting in shingle fashion. Overlapping of adjacent strips of excelsior matting will not be required. Place matting in contact with the soil at all points and secure in place with wire staples. Lap and staple, according to the details shown.

207.3.04 LAWNS AND GRASS

207.3.04A PROJECT SCHEDULE

Within 20 calendar days of the date specified for commencement of work, submit for approval a time schedule indicating dates for beginning and completion of the following operations:

1. Delivery of Materials
2. Preparation of Seedbed
3. Planting Grass
4. Maintenance

207.3.04B DELIVERY, HANDLING AND STORAGE OF SOD

Deliver sod immediately on lifting and after lawn bed is prepared for planting. Protect sod from drying by covering during delivery to protect from sun and wind. Store materials only in designated areas.

Broken pieces and torn or uneven ends will not be accepted.

Sod shall be installed within 48 hours after harvest.

207.3.04C PREPARATION OF SUBGRADE

After rough grading is completed and before topsoil is spread, apply lime and/or superphosphate as determined by soil analysis, and mix to a depth of 6 inches. Conform to manufacturer's recommendations for applying lime and superphosphate simultaneously, and schedule application or applications accordingly.

207.3.04D SUBSURFACE DRAINAGE

Lay drainage pipe on firm bed of gravel with minimum fall of 0.5 percent and located as shown on plans. Place pipe at a minimum depth of 24 inches and not any deeper than required to produce minimum fall. Cover backfill with fiberglass mat to prevent infiltrations of soil. Backfill trenches with gravel to within 4 inches of subgrade.

Place other drain materials in conformance with the applicable requirements in DIVISION 4 -SEWERS. Complete backfilling of trenches with a 4 inch layer of coarse sand and tamp for compaction, as approved.

207.3.04E TOPSOIL AND FINISH GRADIN

Spread topsoil and soil conditioner over the prepared rough grade using a rubbertired tractor with grader blade or equivalent, weighing a maximum of 3 1/2 tons. Imported topsoil must be incorporated with at least a 4-inch layer of subsoil. Thoroughly mix the applied materials to a depth of 8 inches using a disc or cultivator over the entire area in two directions at right angles. Rake topsoil area to a uniform grade so that all areas drain, as shown on plans or as approved. Remove all trash and any stones exceeding 1 inch in diameter from area to a depth of 4 inches prior to preparation and planting grass.

207.3.04F SOIL STERILANT

Apply specified soil sterilant at rate recommended and by method approved by Manufacturer or as specified.

207.3.04G SEEDING

Plant grass seed only at times when local weather and other conditions are favorable to the preparation of the soil and to the germination and growth of grass seed. Sow grassed areas evenly with a mechanical spreader at recommended rate and method approved by Oregon Department of Agriculture Extension Service. Method of seeding may be varied, as approved, however, responsibility to establish a smooth, uniformly grassed area will not be waived. Hydroseeding will be permitted, unless otherwise specified.

207.3.04H SODDING

Before sod is laid, correct soft spots and irregularities in grade of prepared bed, as approved. Lay sod, and tamp or roll so that no voids occur. Water sod thoroughly. Complete sod surface true to finished grade even and firm. On slopes steeper than 1 to 2, fasten sod with wooden pins 6 inches long driven through sod into soil flush with top of sod at approved intervals.

207.3.04I MULCHING AND PROTECTION OF SLOPES

Mulch all areas with a slope from 5 percent to 20 percent by -spreading a uniform light cover of straw mulch over the seeded area at a rate of 1½ tons per acre.

In areas with a slope steeper than 20 percent, and up to 25 percent, install erosion control netting. In non-turf areas, cover netting with fir bark mulch.

Mulch all areas with a slope steeper than 25 percent with spray mulch applied at a rate of 15 gallons per 1,000 square feet after wetting the ground with water penetrating at least 1 inch deep.

Protect new seeded area from pedestrian traffic. Unless otherwise approved, erect a fence of 2 inch by 2 inch posts 4 feet high spaced 10 feet, on center and strung with jute, hemp, or a single strand of No. 12 gauge wire marked with cloth strips at 3-foot intervals between posts.

207.3.04J MAINTENANCE / ESTABLISHMENT PERIOD

Begin maintenance immediately after each portion of lawn is planted and continues for 8 weeks after all lawn planting is completed.

Water to keep surface soil moist. Repair washed out areas by filling with topsoil, fertilizing, and seeding. Replace mulch on banks when washed or blown away. Repair fencing as needed. Mow to 2 inches after grass reaches 3 inches in height, and mow frequently enough to keep grass from exceeding 2 ½ inches.

Weed by local spot application of selective herbicide only after first planting season when grass is established.

207.3.04K LAWN GUARANTEE

If, at the end of the 8 week lawn maintenance/ establishment period, a satisfactory stand of grass has not been produced, immediately renovate and reseed the unsatisfactory portions of lawn, or when approved, reseed at the beginning of the next planting season. If a satisfactory stand of grass develops by June 1st of the following year, the lawn will be accepted. If the lawn is not accepted, a complete replanting will be required during the ensuing planting season.

A satisfactory stand is defined as a lawn or section of lawn that has:

1. No bare spots larger than 3 square feet.
2. Not more than 10 percent of total area with bare spots larger than 1 square foot.
3. Not more than 15 percent of total area with bare spots larger than 6 inches square.

207.3.04L INSPECTION FOR ACCEPTANCE

Submit a written notice eight weeks after the start of maintenance on the last section of completed lawn. Within 15 days of such written notice the Owner's Representative will make an inspection of the lawn to determine if a satisfactory stand of grass has been produced.

207.3.05 TREES. SHRUBS AND GROUND COVER

207.3.05A DELIVERY, PREPARATION AND STORAGE

Furnish container-grown or B&B plants, unless otherwise specified. Balling and burlapping shall conform to the standards of the "American Standard for Nursery Stock". Root balls shall be firm, intact and held solidly together by a fibrous root system. Root balls shall consist of only the earth in which the plant has been growing. "Made" balls will be rejected. Root balls shall be securely wrapped with jute burlap or other wrapping material not harmful to plants.

Bare-root deciduous plants may be used if requested in writing and written approval is given. Approval of bare-root shrubs shall be subject to conditions determined by the Owner's Representative.

All bare-root plant material shall have dormant buds at the time of planting.

If plants are not in dormant state, spray with anti-desiccant to cover foliage as recommended by Manufacturer, prior to digging plants. During shipment, protect plants with tarpaulin or other approved covering to prevent excessive drying from sun and wind.

Cover balls of Balled and Burlapped plants, and containers of Container Grown plants which cannot be planted immediately upon delivery with moist mulch to protect from drying. Plant or heel-in Bare Root plants immediately upon delivery. Water plants as necessary to prevent drying until planted. Do pruning only at time of planting.

207.3.05B SOIL CONDITIONING

Use soil conditioners in planting backfill mix or plant bed preparation where shown, specified or directed as in Subsection 207.2.06 SOIL CONDITIONERS or as specified in special provisions.

207.3.05C PLANTING PROCEDURES

Within 20 calendar days after receiving the notice to proceed, submit a time schedule for approval indicating dates for commencement and completion of the following operations:

1. Tagging of plants in the nurseries.
2. Survey and staking of plant locations.
3. Delivery of topsoil and other materials.
4. Digging and preparation of plant pits and beds.
5. Delivery of trees and plants to the sites.
6. Planting of trees and other plants.
7. Fertilization and application of pre-emergent herbicide.
8. Guying, staking and mulching.
9. Completion of work for start of guarantee period.

At least 20 days before start of the establishment period, submit a schedule of proposed maintenance operations indicating the number of man-hours contemplated for each operation by season during autumn, winter, spring and summer.

This work consists of furnishing, planting and establishing specified plant materials in planting areas shown or directed.

Materials shall meet the following requirements:

Fertilizers	207.2.10
Mulch Materials	207.2.11
Plants	207.2.01
Soil Conditioners	207.2.06
Topsoil	207.2.04

1. Kind-Sizes and Quantities - The plans will show kinds, sizes and approximate quantities of plants.

   Plant sizes shown are minimums and larger plants may be furnished by the Contractor at no extra charge to the City. Any plants substituted, according to Subsection 207.2.01C, shall meet applicable requirements of Section 207.2.01.

   Do not plant any material until it has been inspected and approved.

2. Planting Layout - Outlines of planting areas and plant locations shown are approximate unless shown with dimensions. All location layout and staking is the responsibility of the Contractor, subject to approval before planting of each item begins. The Owner's Representative will make only field measurements necessary to calculate and verify quantities for payment.

   Adjust tree locations to avoid future conflicts with overhead lines, structures, and signing as directed. In mowable grass areas, locate trees at least 10 feet from the edge of plant beds, other trees, fences, and ditch bottoms unless otherwise specified or directed.

3. Preparation of Area - Finish planting areas to smooth lines, grades, and cross sections. Remove all vegetation to be cleared, large clods, float rocks, boulders, debris and excess soil. Finish areas receiving bark mulch to establish grades and leave 3-inches below the finished grades of walks, curbs, driveways and pavement for the mulch. Neatly edge the border of adjoining lawn. Repair irregularities exceeding 1-inch below grade before placing bark mulch. Trees planted outside of plant beds shall have a 3-foot diameter circle maintained as a plant bed throughout the establishment period.

Contractor must submit weed control plan to Owner's Representative for approval prior to commencement of work.

Prepare planting areas by one or both of the following methods as shown or specified:

(a) Method "A" (Cultivated Areas) -Unless otherwise specified, cultivate plant beds to a depth of six inches. Thoroughly mix soil conditioners or soil amendments shown or specified into the top six inches of plant beds.

(b) Method "B" (Non-Cultivated Areas) -Spray existing vegetation with herbicide to kill all top growth and roots in areas not requiring cultivation. Do not spray plants to be saved. After inspection and approval, remove and dispose of dead plant material within 2 inches of the surface. Plant roots may be left in the soil. Use herbicides that have limited residual toxicity to permit safe planting as required under the contract. Replace plants damaged by herbicide application at the Contractor's expense.

4. Excavation - Keep topsoil loose and friable and separate from subsoil. Do not use alkali soil, subsoil, gravel or rocks in backfilling. Dispose of these materials in a satisfactory manner.

Scarify planting pit sides and bottoms to eliminate glazed surfaces.

If standing water is in a planting pit, notify the Owner's Representative so that corrective measures can be taken.

Provide planting pits as follows:

TREES—Provide pits for trees at least 12 inches greater in diameter than that of the earth ball, or the spread of the root system of bare-root trees. Tree pits shall be not less than 2 feet deep and at least 1 foot below the bottom of the ball or spread roots.

SHRUBS—Provide pits for shrubs at least 12 inches greater in diameter than that of the earth ball, or the spread of the root system of bare-root shrubs. Shrub pits shall be not less than 1 foot deep and at least 6 inches below the bottom of the ball or spread roots.

VINES—GROUNDCOVERS AND OTHER PLANTS -Provide pits at least 6 inches around and beneath the earth ball or the spread roots. Trenches may be provided in place of pits.

5. Planting - Perform all planting work using good horticultural practices.

Do all planting in topsoil meeting the requirements of Subsection 207.2.04 TOPSOIL.

Set upright growing plants plumb and plants of the prostrate type normal to the ground surface. Set all plants so that, after settlement, they are at the same level as when growing in the nursery or container.

Water the pits for vines and groundcovers before placing the plants. Then place fertilizer as specified in the Special Provisions in the planting pit and add one inch of soil to protect plant roots. Immediately after placing vine or groundcover plants, completely moisten the backfill.

Cleanly cut off broken or frayed roots of bare-root plants before planting. Spread out the roots in their natural position around the pit and place prepared topsoil to fill all voids

Balled and burlapped plants may be placed with the wrapping in place if all materials are untreated and biodegradable. When burlap is left around plants, completely remove the string and fold down the burlap from the top half of the rootball.

Water plants during planting to eliminate air pockets and minimize settlement of the backfill. After fertilizer is placed, carefully tamp the backfill firm. Form a shallow water holding saucer in the soil. Dispose of excess soil in an approved manner.

Bark mulch may be placed before making the pits for planting vines and ground covers. Rake bark mulch away from planting pits so the bark is not contaminated. After planting, evenly spread excess soil and rake bark mulch back into place.

6. Soil Conditioners - Use soil conditioners in planting backfill mix or plant bed preparation where shown, specified or directed.

7. Fertilizing - As shown or specified in special provisions.

8. Pruning and Staking - Perform pruning at or before the time of planting using good horticultural practice appropriate to the type of plant. Prune to remove all dead, damaged crossed or rubbing twigs and branches and compensate for loss of roots during planting. Make cuts close to the parent stem, but not flush or through the bark "knob" at the branch joint.

   Furnish tree stakes of 2" x 2" Douglas Fir or Pine, construction grade or better, either finished or rough sawn. Stain all tree stakes with an approved dark green penetrating oil stain. Use tree stakes 6 feet long for trees less than 8 feet tall and 8 feet long for trees 8 feet or taller. Place tree stakes parallel with the prevailing winds and drive vertically into the ground at least 12" below the planting hole depth.

   Tree ties shall be either:

   - Plastic chain-type, approximately 1" wide by 1/8" thick, or
   - Approved equal -see Special Provisions for specified tree ties.

   When plastic chain-types are used, use two stakes for all trees. For a 6-foot stake, locate one plastic chain tie 2 to 6 inches below the top of the stake. For an 8-foot stake, use 2 plastic chain ties, with the bottom tie located about 12 inches below the top tie. Cross each plastic chain tie between the tree and stake, then wrap once around the stake and securely fasten.

9. Bark Mulch - Unless otherwise shown, uniformly mulch planted areas to a nominal 3-inch depth with medium fir or medium hemlock.

   Apply bark mulch only after the bed is made free of weeds and debris and the surface is brought to a smooth finished grade. Complete all planting work, except for vine and groundcover planting, before placing bark mulch.

Replace bark mulch which is displaced or blown away, and correct to specified depth any bark mulch placed to a greater than specified depth at the Contractor's expense. Keep bark mulch off plants, structures, roadways, rock shoulders, walks, and grass areas. Completely uncover plants covered by mulch material as soon as possible.

The applied bark mulch shall present a smooth and even appearance as approved by the Owner's Representative (raking may be required).

10. Clean up during construction - Leave the project in a neat, orderly condition and remove unsightly material such as flats, cans, boxes and burlap at the end of each working shift.

11. Watering - Water all plants at intervals as required to maintain and promote growth. In watering shrub areas adjacent to lawns, avoid excessive watering which may leach herbicide and damage the lawn. Repair any damaged lawn at the Contractor's expense.

12. Weed control - To aid in weed control during the establishment period, apply an approved granular pre-emergent herbicide according to the product label and as directed. Be responsible for any damage to plants caused by the herbicide. Contractor shall submit weed control plan to Owner's Representative for approval prior to commencement of work.

207.3.05D PLANT ESTABLISHMENT

The "plant establishment" shall be understood to be part of planting work to assure satisfactory growth of planted materials. The plant establishment period will begin when the original planting and all landscape construction under the contract has been completed and approved. The length of the establishment period will be one calendar year or as defined in the Special Provisions.

Before the beginning of the establishment period, remove and replace all plants that are dead, partially dead, or which do not meet specifications, with healthy plants. All plants in place after this replacement will be classed as the "original planting" and will be subject to establishment.

Care of the work -During the establishment period, maintain a vigorous growing condition by:

1. Watering, weeding, cultivating, pruning and repairing.
2. Adjusting tree stakes and guys.
3. Spraying for pest control.
4. Removing dead plants or plants not showing vigorous growth.
5. Replacing missing plants.
6. Remulching plant areas as directed.

Keep plant beds in a weed-free condition during the establishment period. In addition, eliminate weeds and debris on the right-of-way between planted areas and adjacent shoulders or paved areas until completion of the plant establishment period.

Until final acceptance of the work under the contract, be responsible for and repair any damage caused by traffic or vandalism or acts of neglect on the part of others, at the Contractor's expense or as otherwise defined in Special Provisions.

Periodic inspections - During the establishment period, make inspections jointly with the Owner's Representative near the end of:

1. One-third of the establishment period,
2. Two-thirds of the establishment period,
3. The end of the establishment period.

At these inspections, corrective actions to bring the work into compliance with specifications will be determined by the Owner's Representative. A written notice of corrective actions required will be mailed to the Contractor. Notify the Owner's Representative when the work is ready for inspection.

Corrective work -Complete the corrective work within fifteen calendar days after written notification has been mailed to the Contractor, except that plant replacements shall be made only during the appropriate planting season unless otherwise approved by the Owner's Representative. The fifteen calendar days will not include those days the Owner's Representative determines are impractical for work to be performed.

For each calendar day that corrective work is not completed after the fifteen calendar day period has expired, a proportional amount of the monies otherwise due the Contractor for that inspection time will be deducted from the contract as payment for liquidated damages accrued by the City. The amount of liquidated damages will be determined as defined in the Special Provisions, or Section 108.08 LIQUIDATED DAMAGES.

When the corrective work has been reinspected and is completed to the satisfaction of the Owner's Representative, the appropriate proportional payment due the Contractor, minus liquidated damages if any, will be made.

Provide plant replacements of the same variety, size and quality as specified for the original plants. If bare-root or balled and burlapped plants are not available, furnish container grown plants.

Final inspection -After plant replacement work and any other required work has been completed, the Owner's Representative will make a final inspection. All plant materials, planting beds and other facilities shall be according to specifications as a prerequisite for acceptance.

207.3.05E MAINTENANCE / ESTABLISHMENT WORK

Begin maintenance immediately after each plant is installed and continue to maintain until the end of the establishment period.

Perform the following operations:

(1) Watering as often as required to maintain capillary water within 2 inches of the soil surface around plants.

(2) weeding of plant beds, planting saucers and plant pockets to keep free of weeds, using approved selective herbicide according to the Manufacturer's directions for use, and/or weeding by hand watering methods.

(3) mulching monthly to replenish mulch and keep at required 3-inch minimum depth.

(4) tightening and repairing guys to keep trees erect and supported without damage to bark.

(5) resetting plants to proper grades or upright position.

(6) restoration of planting saucers.

(7) seasonal spraying to control disease or insect pests that may impair plant vigor.

Replace plants required by the plant establishment on a regular monthly basis or as specified in Subsection 207.3.05D PLANT ESTABLISHMENT.

207.3.05F FINAL ACCEPTANCE

Submit notice in writing within 20 days for final inspection at the end of the maintenance/establishment period and an inspection will be arranged within 15 days of this date. Final acceptance will be made provided the terms of the plant establishment period have been met and the project site is in the condition specified in Subsection 207.3.05E MAINTENANCE/ ESTABLISHMENT WORK.

207.3.06 IRRIGATION SYSTEMS

207.3.06A GENERAL

Install components of the irrigation system as shown and as recommended by the equipment manufacturers. All sprinkler runouts shall be evenly graded to the drain points shown on plans. Piping beneath paved areas shall have a minimum cover of 30 inches. Construct irrigation system in areas to receive topsoil after topsoil is spread, compacted and rough graded. Steel pipe or copper tubing may be bedded using excavated material. Bed PVC pipe in sand, as shown on plans and backfill to a minimum or 3 inches above the pipe with sand. Determine the final number and location of sprinkler heads after grading is complete, such that complete coverage of all sprinkled areas is provided. Flush out system thoroughly and pressure test before installing sprinkler heads. Adjust flow on each head for proper coverage.

Repair and replace irrigation parts and winterize as necessary.

207.3.06B STEEL PIPE

Ream, clean and remove burrs and mill scale from piping before making up. Make joints with approved joint compound.

207.3.06C COPPER TUBING

Cut tubing square and remove burrs. Clean both inside of fittings and outside of tubings with steel wool and muratic acid before sweating. Take care to prevent annealing of fittings and hard-drawn tubing when making connections. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted.

207.3.06D PVC PIPE

Cut, make up, and install PVC pipe in accordance with the Manufacturer's recommendations, as approved. Lay PVC pipe using the practice of snaking from one side of the trench to the other, 1 cycle per 40 feet or less. Use strap wrenches for tightening threaded plastic joints. Take care not to over-tighten fittings. Do not lay PVC pipe when the temperature is below 40 degrees Farenheit. Sprinklers and valves shall be installed in accordance with the Manufacturer's recommendations, as approved.

207.4.00 MEASUREMENT AND PAYMENT

207.4.01 UNIT PRICE BASE

When so listed in the Bid, payment for the landscaping items will be made on a unit price basis for the number of items actually placed and accepted.

207.4.02 LUMP SUM BASIS

When so listed in the Bid, measurement and payment will be made at the contract lump sum pay item for Landscaping, complete.

208 RESTORATION AND CLEANUP

208.1.00 DESCRIPTION

This section covers the work necessary to restore and clean up the site, and remove all construction equipment, refuse and unused materials of any kind resulting from project activities.

208.2.00 MATERIALS

Provide all materials required to accomplish the work as specified.

208.3.00 CONSTRUCTION

208.3.01 REMOVAL OF MATERIALS

Periodically, as directed by the Owner's Representative, as the work progresses, and immediately after completion of the work, clean up and remove all refuse, debris, equipment and unused materials of any kind resulting from the work. Upon failure to do so within 24 hours after directed, the work may be done by the Owner or a third party and the cost thereof be deducted from any payment due or to become due to Contractor.

As a condition precedent to final acceptance of the project by the Owner's Representative and as approved by the Owner's Representative, remove all equipment and temporary structures, and all rubbish**,** waste and generally clean up the right-of-way and the premises. Where brush and trees beyond the limits of the project have been disturbed, remove and dispose of or restore same as directed, at no expense to the Owner.

208.3.02 VERMIN CONTROL

At the time of occupancy by Owner, any structure or structures entirely constructed under the Contract shall be free of rodents, insects, and vermin pests. Arrange to pay for extermination work as may be necessary as part of the contract work within the contract time. Work shall be performed by a licensed agency in accordance with requirements of governing authorities. Assume responsibility for any injury to persons or property resulting from extermination work and for the elimination of any offensive odors resulting from extermination operations.

208.3.03 SURFACE DRESSING

Smooth and dress all slopes, sidewalk areas, planting areas, and roadway to the required cross section and grade by means of a grading machine insofar as it is possible to do without damaging the work or existing improvements, trees and shrubs. Supplement machine dressing by hand work as needed.

Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. Grade all areas true to line and grade as shown and as approved. Where the existing planting is below sidewalk and curb, fill and dress the area to the walk regardless of limits shown. Wherever fill material is required in the planting area, make finish surface high enough to allow for final settlement.

208.3.04 CLEANING DRAINS

Clean all drainage facilities such as inlets, catch basins, culverts and open ditches of all excess material or debris which is the result of the work.

208.3.05 CLEANING PAVED SURFACES AND APPURTENANCES

Clean all pavement surfaces, whether new or existing within the limits of the project. Clean existing improvements such as curbs, gutters, walls, sidewalks, castings for manholes, monuments, water gates, lamp poles, vaults, signs, and other similar installations.

Flush the street with a pressure type flusher. Hand broom or flush all sidewalks.

208.3.06 RESTORING PLANTED AREAS

Hand-rake and drag all former grassed and/or planted areas leaving disturbed areas free from rocks, gravel, clay, or any other foreign material and ready, in all respect, for seeding. The finished surface shall conform to the original surface, be free-draining and free from holes, rough spots, or other surface features detrimental to a seeded area.

208.3.06A RESTORING SEWER PROJECTS

In addition to restoration in 208.3.06 RESTORING PLANTED AREAS above, seed and mulch and provide erosion control fabric as required in accordance to Subsection 105.10 PROTECTION AND RESTORATION OF PROPERTY.

208.3.07 RESTORING MOBILIZATION. BORROW AND DISPOSAL AREAS

Clean all properties which were disturbed during construction of the project. Dispose of all uprooted stumps, felled trees, brush. excess excavation, rock, discarded materials, rubbish and debris. Remove all equipment, tools and supplies and put the property occupied in a neat. clean and orderly condition, in equal or better condition to that existing before move in.

208.3.08 REMOVAL OF SIGNS

Do not remove warning, regulatory, guide, or project signs prior to formal acceptance, except as directed.

208.3.09 RESTORING CURBS SIDEWALKS AND DRIVEWAYS

Repair or replace all curbs, sidewalks, driveways and other structures damaged during construction of the work. When replacing sidewalk at intersection corners, construct curb ramps in accordance with the appropriate standard plan as determined by the Owner's Representative.

208.3.10 RESTORING ROADWAY SURFACES

Periodically, or as directed by the Owner's Representative, as the work progresses and immediately after completion of the work. repair or replace all paved, graveled or traveled roadway surfaces damaged during construction of the work to a condition equal to or better than that existing before move in. Refer to Section 405 RESURFACING, for additional details.

For surface restoration of all trenches within the public right-of-way see 204.3.13 SURFACE REMOVAL AND REPLACEMENT FOR TRENCHES.

209.4.00 MEASUREMENT AND PAYMENT

208.4.01 LUMP SUM BASIS

When listed in the Bid as a separate pay item, payment for restoration and cleanup will be made on a lump sum basis.

208.4.02 INCIDENTAL BASIS

When neither specified nor shown in the Bid for separate payment, all restoration and cleanup will be considered incidental work for which no separate payment will be made.

209 EROSION CONTROL

209.1.00 DESCRIPTION

This section covers all work necessary to construct, install, and maintain erosion and sediment control measures on a construction site.

209.2.00 MATERIALS

209.2.01 EROSION CONTROL STANDARDS

Standards for erosion and sediment control measures are published under a separate reference: EROSION PREVENTION AND SEDIMENT CONTROL PLANS TECHNICAL GUIDANCE HANDBOOK (February, 1994) or most current edition (hereinafter referred to as the Erosion Control Handbook). This publication is available at the Permit center located at 1900 SW 4th Avenue, Portland, Oregon.

209.2.02 EROSION AND SEDIMENT CONTROL PLAN

Submit an Erosion Control Plan and completed Erosion Control Information Form to the Owner's Representative for approval prior to commencement of construction. A sample of the Erosion Control Information Form is set forth in Appendix B of the Erosion Control Handbook.

The contractor must follow the approved Erosion Control Plan, containing the elements set forth in Section 2.0 of the Erosion Control Handbook-, as applicable. Failure to install and maintain standard erosion control measures may result in a complete work shut down until standards are met. The contractor is responsible for determining whether particular site conditions require specific materials to ensure adequate erosion control as required by the Erosion Control Handbook.

209.3.00 CONSTRUCTION-INSTALLATION. MAINTENANCE. AND REMOVAL

209.3.01 CONSTRUCTION AND INSTALLATION

Construct and install the erosion control measures as outlined *in the Erosion Control Information Form and according to the Erosion Control Handbook and the approved Erosion Control Plan.

209.3.02 MAINTENANCE

Erosion control measures shall be maintained as set forth in the Erosion Control Handbook. Erosion control measures shall be maintained on the site until permanent ground cover is established. Permanent ground cover species shall be indicated on the Erosion Control Information Form or in the Erosion Control Plan. Permanent ground cover shall be established according to the approved Erosion Control Plan. unless otherwise approved by the Owner's Representative.

During active construction, inspect the erosion control facilities daily. Maintain, adjust, repair or replace erosion control measures to ensure that they are functioning properly. Immediately remove eroded sediment carried or tracked onto pavement surfaces, off-site areas, or into storm drainage systems such as storm drain inlets, ditches or culverts. Do not flush sediment into the storm drainage system. Collect and dispose of sediment on site or as directed by Owner's Representative. Water containing sediment shall not be flushed into storm drainage systems or water ways without first passing through an approved sediment filtering facility or device.

On inactive construction sites, inspect the erosion control measures weekly and within 24 hours after any storm event of greater than 0.5 inches of rain per 24 hour period. Make adjustments and repairs to ensure the proper functioning of the measures.

209.3.03 REMOVAL

When permanent ground cover is established, all temporary erosion control measures shall be removed from the construction site, unless otherwise approved by the Owner's Representative.

209.4.00 MEASUREMENT AND PAYMENT

209.4.01 LUMP SUM BASIS

When listed in the Bid as a separate pay item, payment for erosion control measures will be made on a lump sum basis.

209.4.02 INCIDENTAL BASIS

When not listed in the Bid, all erosion control measures will be considered incidental work for which no separate payment will be made.

209.4.03 UNIT PRICES

When listed in the Bid as single items. the accepted quantities will be paid for at the c unit price per unit of measure for the item.