

PART III – TECHNICAL SPECIFICATIONS

Division 2 – Materials

Division 3 – Site Work

Division 4 – Streets

Division 5 - Water

Appendix “A” – Submittal Checklist

DIVISION 2 – MATERIALS

<u>SECTION</u>	<u>DESCRIPTION</u>
SEC 2000	Cast in Place Concrete
SEC 2050	Cementitious Patching & Grouting Materials
SEC 2100	Reinforcement
SEC 2300	Aggregates
SEC 2400	Hot Mix Asphaltic Concrete
SEC 2600	Pipes and Fittings

PART 1 GENERAL

1.1 SCOPE:

- A. This section includes work necessary for furnishing and placing ready-mix concrete, freshly mixed and unhardened state as hereinafter specified.
- B. In the event these specifications lack direction or a situation arises not covered herein ACI 318 and/or ACI 304R shall prevail.

PART 2 PRODUCTS

2.1 CONCRETE:

- A. Ready-mixed meeting ASTM C94, Option A (Contractor shall submit a mix design for approval by the Engineer).
- B. Minimum allowable 28-day compressive field strength shall be 3,500 PSI or as specified for the type of structure under consideration and called for in the Plans.
- C. When specified "High Early Strength" provide a Type III or IIIA mix that will achieve required/specified strength in 3-days

2.2 AGGREGATE:

- A. Aggregates shall conform to ASTM C33 and for lightweight aggregates ASTM C330.

2.3 WATER:

- A. Water shall be clean and free from injurious substances deleterious to concrete and reinforcement.
- B. Reclaimed water, if used, shall meet current codes.
- C. Maximum water-cement ratios;

Compressive Strength (pcf)	Non-Air-Entrained	Air-Entrained
3000	0.58	0.46
3500	0.51	0.40
4000	0.44	0.35
4500	0.38	*
5000+	* Based upon trial mixtures.	

 2.4 CEMENTS

A. Portland cement shall conform to ASTM C150 and be one of five types: Type I, II, IIA, III, IIIA, IV, or V. Blended cements (hydraulic cements) shall conform to ASTM C595 and be one of the five classes as follows;

- | | | |
|----|--------------------|--|
| 1. | Type IS | Portland blast-furnace slag cement; |
| 2. | Type IP and Type P | Portland-pozzolan cement; |
| 3. | Type S | Slag cement; |
| 4. | Type I (PM) | Pozzolan-modified portland cement; and |
| 5. | Type I (SM) | Slag-modified portland cement. |

B. Blended cements manufactured under ASTM C1157 must be approved by the Engineer on a case-by-case basis. If allowed they shall conform to the following types;

- | | | |
|----|---------|-----------------------------|
| 1. | Type GH | General purpose |
| 2. | Type HE | High early strength |
| 3. | Type MS | Moderate sulfate resistance |
| 4. | Type HS | High sulfate resistance |
| 5. | Type MH | Moderate heat of hydration |
| 6. | Type LH | Low heat of hydration |

2.5 REINFORCEMENT:

A. Reinforcing steel shall conform to SECTION 2100, of these specifications.

2.6 ADMIXTURES:

A. Admixtures shall be submitted for approval in the mix-design.

B. Admixtures shall conform to the following:

- | | | |
|----|--|------------|
| 1. | Air-Entraining admixtures | ASTM C260 |
| 2. | Water-Reducing and Accelerating admixtures | ASTM C494 |
| 3. | Pozzolans | ASTM C618 |
| 4. | Slag | ASTM C989 |
| 5. | Silica Fume | ASTM C1240 |

C. Miscellaneous unregulated admixtures may be approved on a case-by-case basis by the engineer.

2.7 FORMS:

A. Make all forms mortar-tight, set them so finished concrete will conform to proper dimensions and contours, and make them sufficiently rigid to prevent distortion due to pressure of the concrete and other loads incidental to construction operations. Construct and maintain forms to prevent warping and opening of joints.

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- B. Design forms to withstand effect of vibration of concrete as it is placed.
 - C. Make wood forms for concrete surfaces, to be exposed to view, of dressed lumber of uniform thickness. Shiplap or S4S boards are acceptable provided forms are mortar-tight. Plywood will be acceptable as a form liner if supported in an approved manner. Ensure that all formwork for exposed concrete surfaces is smooth with grain running in the same direction to give a good finished appearance. Construct metal ties or anchorages within forms to permit their removal to a depth at least 1-inch from face without injury to concrete. Where wire ties are permitted, all wires, upon removal of forms, shall be cut back at least 1/4-inch from face of concrete with chisels or nippers; for green concrete, mopors are necessary. Design all fittings for metal ties so that, upon their removal, cavities that are left will be of smallest possible size. Fill cavities with cement mortar and leave surface sound, smooth, even and uniform.

2.8 EXPANSION/CONTRACTION JOINT MATERIAL:

- A. When specified for concrete structure to have joint material it shall conform to the following;
 - 1. **PREFORMED JOINT FILLERS:** Preformed joint fillers shall conform to AASHTO M153 or AASHTO M213 except that those furnished under AASHTO M213 shall be tested in accordance with ASTM D1751.
 - 2. **PREFORMED ELASTOMERIC JOINT SEALS:** Preformed elastomeric joint seals shall conform to AASHTO M220.
 - 3. **POURED FILLER:** Poured filler for concrete joints shall conform to AASHTO M173.

2.9 CURING MATERIALS:

- A. Curing materials shall conform to the following requirements:
 - > White Polyethylene Film For Curing Concrete: AASHTO M171
 - > Liquid Membrane-Forming Compounds for Curing AASHTO M148

PART 3 EXECUTION

3.1 PREPARATION OF BASE:

- A. Before paving or placing operations begin, the base shall be brought to finished condition, surface compacted, and dampened.
- B. Manholes, inlets, catch basins, drains, and all other structures shall be completed, adjusted, cured, and otherwise prepared, as applicable, and made clean and ready to have concrete placed in contact with them.
- C. For PCC paving, manholes frames and other independent metal structures in the pavement area shall be prepared with an approved bond-preventing agent.

3.2 PLACING REINFORCING STEEL:

- A. Place reinforcing steel as shown and in accordance with CRSI recommended practice for placing bars, and in conformance with SECTION 2100 of these Specifications.

3.3 FORM WORK:

- A. Keep forms in place until concrete has reached a theoretical strength of 1,000 psi. When forms appear to be unsatisfactory in any way, either before or during placing of concrete, work may be ordered stopped until defects have been corrected.
- B. Maintain shape, strength, rigidity, water-tightness, and surface smoothness of re-used forms at all times. Do not re-use warped or bulged lumber, and do not re-use any forms which, in the opinion of the Engineer, are unsatisfactory in any respect. Thoroughly clean re-used forms of all dirt, mortar, and foreign matter.
- C. Treat all forms with an approved form oil or wax or saturate with water immediately before placing concrete. Do not use material, which will adhere to or discolor concrete.

3.4 MIXING AND DELIVERY:

- A. Mixing and delivery shall be in conformance to ASTM C94 and sampling by Alternative No.2.
 - 1. As mixer is being emptied, individual samples shall be taken after discharge of approximately 15-percent and 85-percent of the load.
- B. Mixing time shall conform to ASTM C94 of between 12 and 18rpm.
- C. Mixing time shall not exceed ASTM C94 of 1-1/2 hours or 300 revolutions, whichever comes first.
- D. WATER: Water shall not be added to mix at the job site unless a slump test has been conducted and indicates the mix delivered is less than min slump of the mix-design. Water may be added at that time only and only once. The drum shall be turned at least 30 times once water is added prior to placing mud. The batch ticket shall be modified to indicate the amount of water added.
- E. TEMPERATURE: Mix delivered to job site shall have a minimum temperature of 50°F and shall not exceed a maximum of 90°F.

3.5 PLACING CONCRETE:

- A. Do not place concrete without the approval of the engineer. Concrete placed without engineer's approval may be rejected and removal required.
- B. In preparation for placing of concrete, remove all sawdust, chips, blocks, and other construction debris and extraneous matter from interior of forms. Remove struts, stays, and braces, serving temporarily

3.6 COMPACTION AND CONSOLIDATION:

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- A. During placement, the concrete shall be thoroughly consolidated to develop a cohesive mass that fills all voids in the formwork. Apply approved vibrator to concrete to accomplish a well-mixed, cohesive mass. Do not spread vibrating points any further than maximum effective radius.

3.7 FORM REMOVAL:

- A. Contractor shall assume full responsibility for all damage resulting from premature removal of forms. Do not place backfill against walls below grade, and do not remove forms and shoring from below grade structural slabs or beams until concrete has reached an actual field strength equal to 75-percent of the specified 28-day design field strength. Actual field strength shall be determined from field cured test cylinders, which shall be cured under conditions equivalent to the most unfavorable conditions for the portions of concrete, which the cylinders represent.
- B. Do not use methods of form removal likely to cause over-stressing of concrete. Do not remove forms and their supports without approval. Remove supports in such a manner as to permit concrete to uniformly and gradually take the stress due to its own weight.
- C. After forms have been removed, carefully point, with mortar, all depressions resulting from removal of form ties or other causes.

3.8 SURFACE FINISHING:

- A. Concrete shall be screeded off, bullfloated and edge shined (when required) as shown on the Plans.

3.9 JOINTS:

A. CONSTRUCTION JOINTS:

- 1. Provide construction joints at locations and manner detailed on plans. Work shall be planned in advance to place pour to construction joints for a days work. No construction joint shall be placed without the approval of the Engineer.

B. CONTRACTION/EXPANSION JOINTS.

- 1. Provide contraction/expansion joints at locations called out on the Plans.
- 2. Contraction/expansion joints shall a minimum of 2/3 of the thickness.
- 3. Premolded joint filler as specified in sub-section 2.8 shall be used in contraction/expansion joints that occur between existing and new concrete surfaces such as vaults, manholes, columns, footings and the like and/or as located by call out on the Plans.

C. MISCELLANEOUS JOINT REQUIREMENTS.

1. Cut back existing curbs, walks, driveways, and other such structures to permit the new construction and where the new structures are to be constructed against or within 6-inches (min.) of the end, edge, or side of structures, the construction shall include the construction of approved connections therewith, using the same kind of concrete as is used in the new construction. Make the joint between the old and new material with a saw cut.

3.10 CURING:

- A. Keep concrete continuously wet for 7-day period. Intermittent wetting is not acceptable.
- B. Contractor can additionally use curing compound to keep concrete wet. Compound use shall be at the discretion of the Contractor, with an approved compound and applied as follows:
 1. **LIQUID MEMBRANE FORMING COMPOUNDS** - Liquid membrane forming compounds shall be applied uniformly to the damp concrete by pressure-spray methods at the Manufacturer's recommended rate. The compound shall form an impervious membrane when tested in accordance with ODOT TM 721.
 2. **POLYETHYLENE FILM** - White or clear polyethylene film, a minimum of 4-mils in thickness, shall be applied to damp concrete as soon as the film can be placed without marring or discoloring the surface. The membrane shall be placed in contact with the surface, shall extend beyond the sides or edges of the slabs or forms, and shall be held in position to maintain a moisture proof covering. Laps shall be sufficient to maintain waterproofing equivalent to the sheeting.

3.11 WEATHER LIMITATIONS:

- A. Contractor shall assume full responsibility for the concrete work during unusual weather conditions including but not limited to hot and cold weather. Any work not in conformance to the Plans and Specifications may be rejected by the Engineer and replaced and/or repaired at the contractor's expense.

3.12 DEFACEMENT OF CONCRETE:

- A. Contractor shall be responsible for the first 48-hours of concrete structure to ensure defacement does not occur. Repair shall be at the expense of the Contractor.

3.13 MEASUREMENT AND PAYMENT:

- A. Placed redi-mix will be field measured and quantified for the specific end use product built (i.e. sidewalk, slab, thrust block, curb, etc.)

3.14 SUBMITTAL REQUIREMENTS:

- A. Submit the following as a minimum.
 - 1. Current Mix-Design specifically for this project including any and all admixtures.
 - 2. Catalog cut sheets on curing compound.
 - 3. Catalog cut sheets on joint filler material – when required.

PART 4 TESTING

4.1 FIELD TESTS

- A. The Engineer may have test cylinders taken and tested by an approved testing laboratory to verify concrete strength at his discretion.
- B. Acceptance and evaluation of concrete properties and characteristics in accordance with the relative ASTM standard and/or ACI 318.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section is to provide direction in the supply, use and placement of a variety of cementitious materials used in and on various public works construction projects.
- B. The Contractor shall provide a submittal on all cementitious materials to be used in the construction of the awarded project to the Engineer for approval. Submittal shall include Manufacturer's directions on use, preparation of base, application conditions and finishes. Further the Contractor shall be responsible to ensure he is submitting the proper product for the intended application.

PART 2 PRODUCTS

2.1 MORTAR:

- A. Mortars, made of hydrated lime, shall not be used in underground nor corrosive conditions.
- B. Mortar shall be as manufactured by Ross Island, or approved equal and conform to the requirements of ASTM C387.

2.2 NON-SHRINK GROUT:

- A. Non-shrink grouts shall be used for plugging of confined holes or spaces where expansion of the grout is not of a concern and where specified and shown on the plans.
- B. Non-shrink grout shall be as manufactured by Five-Star, Tamms or approved equal and conform to the requirements of ASTM C1107 and/or CRD C-621 (Corps. of Engineers).

2.3 PATCHING COMPOUNDS:

- A. Patching compounds used for holes where expansion is acceptable and cover over masonry surfaces, cracks, over Non-shrink grouts (as a confinement) and/or where specified and shown on plans.
- B. Patching compounds shall be as manufactured by Tamms (Speedcrete Red Line) or approved equal and conform to the requirements of ASTM C928.
- C. Bonding agent for patching compounds shall be as prescribed by the approved patching compound manufacturer. Water shall not be used as a substitute for the commercial bonding agent.

2.4 FLOWABLE GROUT:

- A. Flowable grout for use in filling of annular spaces of pipes, vaults and etc., underground for abandonment in place shall be lean redi-mix with a maximum aggregate size of 1/4-inch. The water-cement ratio shall be such to provide a consistent flowable mix. Admixtures for pumping and or strength are acceptable.
- B. Flowable grout shall have a minimum 28-day strength of 3,000-psi.
- C. This is not a digable mixture like that of Controlled Density Fill.

2.5 PORTLAND CEMENT GROUT:

- A. Furnish Portland cement grout consisting of one part Portland cement and three parts sand (by mass) thoroughly mixed with a minimum amount of water to produce a thick, creamy consistency. The sand shall conform to ODOT Specification for "Fine Aggregates" and Portland cement to Section 2000 of these Technical Specifications.

2.6 CONTROLLED DENSITY FILL (CDF):

- A. Controlled density fill (CDF) shall be a rippable mixture composed of Portland cement, fly-ash, aggregates, water and admixtures proportioned to provide a non-segregating, free-flowing material which will result in a hardened, dense, no-setting fill. This mixture shall be batched and mixed in accordance with ASTM C94.
- B. CDF shall have an unconfined compressive strength of 2000-psi at 28-days.
- C. Materials and testing shall conform to the following;
 - 1. Portland Cement: ASTM C150, Type I or II
 - 2. Fly-ash: Class F or Class C, ASTM C618
 - 3. Aggregates: Section 2300 and ASTM C33
 - 4. Water: Potable
 - 5. Admixtures: AASHTO M194 or ASTM C494 or ASTM C260

PART 3 EXECUTION**3.1 GENERAL:**

- A. Contractor shall have, on site, the Manufacturer's catalog sheet with directions and recommendations and make it available to the Engineer.
- B. Place material in locations as shown on the plans, to industry standards and in accordance with the Manufacturer's recommendations.
- C. Surface preparation is the most important part of the application process. Contractor shall follow manufacturer's directions implicitly and ensure the surface(s) to receive applications are clean, sound, roughened and stable.

- D. Do not mix up more products that can be used in the initial set times as indicated by the Manufacture. Never add water or agent to attempt to regenerate material. Material not used within Manufacturer's set time shall be disposed of.
- E. Finish shall be as specified (wet broomed or trowel finish) and the work is done as directed by the Manufacturer.

3.2 MEASUREMENT AND PAYMENT:

- A. MORTAR – Unless otherwise specified in the Bid Proposal all grout work will be incidental to the work it is applied to.
- B. NON-SHRINK GROUT - Unless otherwise specified in the Bid Proposal all grout work will be incidental to the work it is applied to.
- C. PATCHING COMPOUNDS – Unless otherwise specified in the Bid Proposal all grout work will be incidental to the work it is applied to.
- D. FLOWABLE GROUT- Payment will be made on a unit price as specified in the Bid Proposal to the nearest 0.1 LF, CY or as otherwise indicated.
- E. Controlled Density Fill (CDF): Payment will be made on a unit price as specified in the Bid Proposal to the nearest 0.1 LF or CY or as otherwise indicated.

PART 4 TESTING

4.1 GENERAL:

- A. The Engineer may, at his discretion, select samples to be collected, tested and retained for quality assurance purposes.
- B. Testing samples, cubes, cylinders etc. shall be accomplished by a certified laboratory.

4.2 MORTAR:

- A. Mortar samples shall be tested in accordance with ASTM C109.

4.3 NON-SHRINK GROUT:

- A. Non-shrink grout samples shall be sampled and tested in accordance with ASTM C109.

4.4 PATCHING COMPOUNDS:

- A. Patching compounds shall be sampled and tested in accordance with ASTM C109.

4.5 FLOWABLE GROUT:

- A. Flowable grout shall be sampled and tested in accordance with ASTM C109.

4.6 CONTROLLED DENSITY FILL (CDF):

- A. CDF shall conform to testing of ASTM D4832.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section covers work necessary for reinforcing steel, welded wire fabric, dowels, and accessories, for concrete structures, complete.

PART 2 PRODUCTS

2.1 BAR REINFORCEMENT:

- A. Use steel deformed bars conforming to ASTM A615, Grade 40, unless otherwise shown, except that longitudinal bars in continuously reinforced concrete pavement and high strength bar reinforcement shall be Grade 60.

2.2 DOWELS:

- A. For concrete pavement, slab, or wall load transfer devices at joints and other elements, use dowels conforming to ASTM A306, Grade 70 unless otherwise specified. Coat with plastic or other approved material for bond prevention where specified.

2.3 BAR MATS:

- A. For bar and rod mats, use the clipped type, conforming to ASTM A184.

2.4 SPIRAL REINFORCEMENT:

- A. Use plain wire for spiral reinforcement conforming to ASTM A82, except that f_y shall be the stress corresponding to a strain of 0.35 percent if design yield strength exceeds 60,000 psi.

2.5 WELDED WIRE FABRIC:

- A. Welded wire fabric shall conform to ASTM A185.

2.6 TIES AND SUPPORTS:

- A. Use ties of 16-gauge, black, soft-annealed wire and bar supports approved by Engineer for intended use. Bar supports in beams and slabs exposed to view after stripping must be galvanized or plastic coated. Use concrete supports for reinforcing in concrete placed on grade. Galvanizing shall conform to ASTM A153 Class D. Plastic shall not chemically react with concrete, shall be impervious and a minimum thickness of $3/32$ -inches at point of contact with form.

2.7 CERTIFICATION AND IDENTIFICATION:

- A. Furnish certification that reinforcing bars identified and delivered to project site are as specified. For identification and tagging, include copies of heat numbers, chemical compositions and physical test performed on that heat.

PART 3 EXECUTION**3.1 SHOP DRAWINGS:**

- A. Prior to fabrication and before ordering material, submit all order lists and bending diagrams for approval. Such approval by Engineer in no way relieves Contractor of responsibility for correctness of lists and bending diagrams. Any expense incident to the revision of material furnished in accordance with such lists and bending diagrams in compliance with Plans, shall be borne by Contractor.

3.2 FABRICATION:

- A. Fabricate, ship, tag, and mark bar reinforcement in conformance with Manual of Standard Practice for Reinforced Concrete Construction of the Western Concrete Reinforcing Steel Institute.
- B. Bend all bars cold.

3.3 DELIVERY AND STORAGE:

- A. Deliver steel reinforcement with suitable hauling and handling equipment. Protect at all times from injury. Keep free from dirt, detrimental rust or scale, paint, oil, or other foreign substance.

3.4 PLACING:

- A. Place all steel reinforcement accurately in positions shown on Plans and hold firmly during placing and setting of concrete. For bars in top mats of footings and deck slabs, tie at all intersections. For all other bars, tie at all intersections except where spacing is less than 1-foot in each direction, tie alternate intersections.
- B. Maintain distance from forms by means of stays, blocks, ties, hangers, or other approved supports. For blocks for holding reinforcement from contact with the forms use precast mortar of approved shape and dimensions, and with same compressive strength as concrete in which they are placed. For metal chairs in contact with exterior surface of concrete, fabricate from stainless steel conforming to ASTM A493, Type 430. Turn legs of chairs up a minimum of $\frac{1}{8}$ -inch. Separate layers of bars by precast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe, and wooden blocks will not be permitted. Reinforcement in any member shall be placed and then inspected and approved by Engineer before placing of concrete begins. Concrete placed in violation of this provision may be rejected and removal required.
- C. If fabric reinforcement is shipped in rolls, straighten it into flat sheets before placing it. For fabric reinforcement, extend fabric to within 2-inches of edges of slab, and lap splices at least $1\frac{1}{2}$ courses of fabric with a minimum of 6-inches. Tie laps and splices in fabric securely at ends and at 24-inch intervals, minimum.

3.5 SPLICING:

- A. Furnish all reinforcement in the full lengths indicated on Plans. Splicing of bars, except when shown on Plans, will not be permitted without written approval of Engineer. Stagger splices as far as possible.
- B. For No. 11 bars and smaller, lap splice as shown on Plans. In lapped splices, place bars in contact and wire together in such a manner as to maintain not less than the minimum clearance to the surface of concrete as shown on Plans.
- C. Lap splicing of No. 14 and No. 18 bars will not be permitted. Splice these sizes in conformance with the following:
 - 1. Splice shall develop at least the specified minimum ultimate strength of reinforcing bars in compression and in tension. Where bars of different sizes or strengths are connected, the governing strength shall be the strength of the smaller or weaker bar.
 - 2. Make splices by an approved mechanical butt splicing method utilizing a ferrous filler metal and an enclosing steel sleeve. Submit method to Engineer for approval prior to making splices. Completed splices will be subject to testing at no expense to Owner.

3.6 MEASUREMENT AND PAYMENT:

- A. Reinforcement in concrete will be incidental to the unit price for structure as stated in the form of proposal.

3.7 SUBMITTAL REQUIREMENTS:

- A. Submit the following as a minimum;
 - 1. Suppliers name, address and phone number.
 - 2. Shop drawings of steel cuts and placements.
 - 3. Lot testing data.

PART 4 TESTING

- A. Certification of bar reinforcement will identify the reinforcement by heat number.
- B. The certification shall also contain the weight, number of pieces and dimensions of each size of material of each heat number shipped, the project identification, and date of shipment. If a color is used for identification, the heat number and color combinations shall also be shown.
- C. Each piece of bar reinforcement shall be identified so the engineer can determine the heat number prior to use in the work. Reinforcement shall be tagged and marked in accordance with CRSI Manual of Standard Practice as certification of testing.

END OF SECTION

PART 1 GENERAL**A. SCOPE:**

1. This work consists of furnishing for placement, geotextile material in drains, under embankments, for embankment reinforcement, under riprap, paving inlays, shear keys and erosion control applications, behind retaining structures, over roadbed subgrade, in trench foundation stabilization, and beneath pavement overlays, as shown on the Plans and as directed.

B. DEFINITIONS.

1. **GEOTEXTILE FABRIC** - Geotextile fabric is defined as a fabric manufactured specifically for use in civil engineering applications. Fibers used in the manufacture of geotextiles consist of long chain synthetic polymers. At least 85-percent by weight of the long chain polymers are polyolephins, polyesters, or polyamides.
 - a. **Drainage Geotextile** - For installation in subsurface drains or other drainage locations.
 - b. **Embankment Geotextile** - For installation within or under embankments for stabilization.
 - c. **Riprap Geotextile** - For installation behind and beneath riprap, buttresses, inlays, shear keys, and erosion control applications.
 - d. **Wall Geotextile** - For construction of retained earth walls.
 - e. **Subgrade Geotextile** - For installation on subgrade and in other material separation applications.
 - f. **Pavement Overlay Fabric** - For installation beneath an asphaltic cement overlay.
2. **MACHINE DIRECTION** - The long, or wrap, direction of the geotextile. The cross-machine, or fill, direction is perpendicular to the machine direction.
3. **NONWOVEN GEOTEXTILE** - A textile produced by bonding and/or interlocking of fibers by mechanical, heat, or chemical means.
4. **WOVEN GEOTEXTILE** - A textile comprising two or more sets of filaments or yarns interlaced in such a way that they result in a uniform pattern.
5. **ROLL** - Unit of continuous geotextile without transverse seams as furnished by the manufacturer. Roll sizes may vary between manufacturers and types of geotextiles.
6. **ROLL VALUES** - Roll values are as follows:

- a. **Average Roll Value** - The average roll value for each property is determined by testing a representative number of samples in a roll according to the test methods specified in Part 4 - Testing. An average of these tests becomes the average roll value for each roll tested.
 - b. **Minimum Roll Value** - The minimum average roll value for each property is the mean of the average roll values for all rolls tested minus 2 standard deviations, all as determined by the manufacturer. The minimum average roll value for each property is determined by testing a representative number of rolls in a production run according to ASTM D4354 sampling procedures and the test methods specified in Part 4 Testing.
 - c. **Minimum Value** - The minimum value is the specified value for each geotextile property that shall be met or exceeded by the manufacturer's minimum average roll value for the production run and, if sampled and tested by the average roll value for any roll.
7. **SEAM ALLOWANCE** - The minimum distance from the edge of a geotextile to the stitch-line nearest to that edge.
 8. **SEAM TYPE** - A designation relating to the essential characteristics of geotextile positioning and rows of stitching in a specified sewn seam as shown on the Plans
 9. **SELVAGE** - The finished edge of a geotextile parallel to the machine direction.
 10. **ULTRAVIOLET STABILITY** - The ability of a geotextile to resist deterioration when exposed to UV rays.
 11. **OTHER DEFINITIONS** - Other terms not defined in this section may be found in ASTM D123 and ASTM D4439.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. The geotextile shall: Be composed of a polymeric yarn or fiber oriented into a stable network which retains its relative structure during handling, placement, and design service life.
- B. The geotextile shall;
 - Meet or exceed the properties specified in Table A-1.
 - Be free of any chemical treatment or coating which might significantly reduce permeability.
 - Have the selvage finished so the outer fibers are prevented from pulling away from the fabric.
 - Be free of defects or tears.
 - Be resistant to ambient temperatures, acid and alkaline conditions, microorganisms and insects.

2.2 ACCEPTANCE REQUIREMENTS:

- A. Base the actual minimum average roll values furnished by the manufacturer on representative test results from the manufacturing plant which produced the rolls, and shall meet or exceed each of the specified minimum values. Clearly label all rolls as being part of the same production run certified as meeting all applicable requirements.

2.3 FIELD SEAM STITCHING EQUIPMENT:

- A. Use field seam stitching equipment that provides an acceptable lock-type stitch as recommended by the geotextile manufacturer and approved by the Engineer.

2.4 GEOTEXTILE PROPERTY VALUES:

TABLE A-1

Geotextile Property	Test Method	Minimum Values							
		Drainage Geotextile (1)		Riprap Geotextile (1)		Subgrade Geotextile	Embankment Geotextile	Wall Geotextile (1)	Pavement Geotextile (1)
Grab tensile strength minimum in each principal direction	ASTM D 4632	Type 1	Type 2	Type 1	Type 2	180 lb	230 lb	---	80 lb
		80 lb	180 lb	200 lb	260 lb				
Grab Elongation	ASTM D 4632	15%		15%		---	---	---	50%
Burst strength, diaphragm method	ASTM D 3786 Mod.	130 psi	290 psi	320 psi	430 psi			---	---
Puncture strength	ASTM D 4833 or ASTM D 3787 Mod.	35 lb	80 lb	80 lb	110 lb	80 lb	110 lb	---	---
Apparent opening size (AOS), US Std. Sieve	ASTM D 4751	No. 70 sieve or smaller opening		No. 70 sieve or smaller opening		No. 30 sieve or smaller opening	No. 30 sieve or smaller opening	(2)	---
Water permeability	ASTM D 4491	0.1 cm/sec		0.1 cm/sec		0.005 cm/sec	0.005 cm/sec	(2)	---
Ultraviolet stability	ASTM D 4355	---		70% strength retained		---	---	70% strength retained	---
Wide strip tensile strength	ASTM D 4595	---		---		---	---	(2)	---
Asphalt retention	ODOT TM 817 (TF25, Method 3) (3)	---		---		---	---	---	0.20 gal/sy
Melting point	ASTM D 276	---		---		---	---	---	300° F

- (1) Silt film or silt tape fabrics are not acceptable.
(2) See Special Provisions for required minimum values.
(3) Task Force 25 test methods, developed by the ASTM Committee on geotextiles and INDA.

PART 3 EXECUTION**3.1 ACQUISITION AND STORAGE:**

- A. Provide complete rolls of geotextile as furnished by the Manufacturer and protect against damage and deterioration. Store all geotextile rolls in a dry place and off the ground at all times according to ASTM D 4873. Cover all rolls a partial rolls with a dark protective covering when

received at the project site. The geotextile will be rejected for use if the Engineer determines it has defects, deterioration, or has been damaged.

3.2 PLACEMENT:

A. SURFACE PREPARATION.

1. Prepare the surface receiving the geotextile to a smooth condition free of obstructions, depressions and debris unless otherwise directed. Do not drag the geotextile on the ground or mishandle in any way.
2. Loosely place the geotextile without wrinkles so placement of the overlying material will not tear the geotextile. Lap or sew the geotextile at the ends and sides of adjoining sheets as specified.

B. SLOPE PREPARATION.

1. Place the geotextile with the machine direction oriented up-down the slope. Lap the upper sheets over the top of the lower sheets. When the geotextile is placed on a slope steeper than 6:1, securely anchor the laps to the ground surface with pins or stakes as necessary to prevent slippage and tearing of the geotextile. Start placement of fill material on the geotextile at the toe of the slope and proceed upwards.

C. WHERE EXPOSED TO WATER.

1. If geotextiles are placed under water or in areas where water will flow, the geotextile may be placed with the machine direction parallel to the direction of water flow instead of the placement direction specified in paragraph (B)(1) "Slope Preparation". Overlap sheets so the upstream sheet is placed over the top of the downstream sheet. Adequately secure the geotextile to prevent slippage. As the geotextile is placed under water, place the backfill material on it to the required thickness. Do not place geotextile more than 50 feet ahead of the specified cover material.

3.3 OVERLAPS:

A. Minimum overlap requirements for geotextiles are:

<u>Geotextile Application</u>	<u>Minimum Overlap Requirements, (inches)</u>
> Drains	12
> Embankment Stabilization	24
> Geotextile Wall Barrier	24
> Pavement Overlays	12
> Riprap and Rock Buttresses	24
> Roadbed Subgrade Stabilization	24
> Pipe Trench Foundation Stabilization	12

B. If the Engineer determines the specified overlap is not sufficient, increase the overlap to provide adequate coverage or sew the geotextile together in the field. If sewn, reference subsection 2.3

"Field Seam Stitching Equipment", and subsection 3.4 "Field Seams".

3.4 FIELD SEAMS:

A. GENERAL.

1. Obtain the Engineer's approval before field seaming and stitching. Sew field seams with polymeric thread consisting of polypropylene, polyester or kevlar, and as resistant to deterioration as the geotextile being sewn.
2. Field seams shall otherwise conform to specifications in ODOT Manual, Section 00350.40.d (or latest revision).

3.5 PROTECTION OF GEOTEXTILE:

- A. Protect the geotextile at all times from ultraviolet (UV) rays, contamination by surface runoff, and construction activities.
- B. Traffic or construction equipment will not be permitted directly on the geotextile unless approved by the Engineer.
- C. When placed for construction, cover the geotextile with specified cover material as soon as possible. Do not leave in uncovered condition for more than 3 days except when used with temporarily retained earth walls and asphalt overlays.
- D. Place cover material on the geotextile in a manner that the geotextile is not torn, punctured, or shifted. Use a minimum 6-inches thick cover layer or twice the maximum aggregate size, whichever is thicker. End-dumping cover material directly on the geotextile will not be permitted.
- E. Limit construction vehicles in size and weight so rutting in the initial layer above the geotextile is not more than 3-inches deep or 1/2 the layer thickness, whichever is lesser. Turning of vehicles on the first layer will not be permitted.

3.6 REPAIR OF GEOTEXTILE:

- A. Repair or replace all torn, punctured, or contaminated geotextiles during construction at no cost to the Owner. Repair by placing a patch of the specified geotextile over the affected area. Overlap geotextiles in accordance with subsection 3.3 "Overlaps". Where geotextile seams are required to be sewn, repair any damaged sheet by sewing unless otherwise indicated on the Plans or Special Provisions.

3.7 DRAINAGE GEOTEXTILE:

- A. When used in trenches or drains, place the geotextile in the trench as shown on the Plans to loosely conform to the shape of the trench with no wrinkles or folds.

3.8 EMBANKMENT GEOTEXTILE:

- A. Construct embankment stabilization according to the details as shown on the Plans. Place the geotextile layers so the geotextile machine direction is transverse to the embankment centerline. Spread the geotextile so all slack wrinkles are eliminated.

3.9 RIPRAP GEOTEXTILE:

- A. Place geotextile behind and beneath riprap, buttresses, inlays, shear keys, and erosion control applications according to the details as shown. Demonstrate to the satisfaction of the Engineer that the combination of the rock fill drop height and thickness of any aggregate cushion, when specified or required, are adequate to not puncture or damage the geotextile when placing the riprap or stone embankment material. In addition, the following limits apply:

<u>Size of Rock</u>	<u>Maximum Drop Height (ft.)</u>	
	<u>Onto Geotextile</u>	<u>On Aggr. Cushion Blanket</u>
Greater than 200 lb (Class 200)	0	3
200 lb (Class 200) or less	3	3

- B. After placing the riprap, backfill all voids in the riprap face so the geotextile is completely covered and not visible.

3.10 MEASUREMENT AND PAYMENT:

- A. When specified in the Form of Proposal as a bid item, geotextile and/or fabric shall be field measured and paid to the nearest 0.1 SY.

3.11 SUBMITTAL REQUIREMENTS:

- A. Submit the following as a minimum.
1. Minimum average roll values for each of the specified properties from the production run as the delivered material.
 2. Production run number, production plant name and location.

PART 4 TESTING

4.1 MANUFACTURER'S SAMPLING AND TESTING:

- A. The Engineer, at his discretion, may require to sample and test products for compliance with pertinent requirements.
- B. The entire production run will be accepted or rejected, based on the out come of the test results.
- C. The Manufacturer's reported property values shall be based on the following sampling and testing requirements:

1. **SAMPLING** - Sample all geotextiles according to ASTM D4354. The production unit used for sampling shall be a roll.

2. **TESTING** - Perform specified tests to determine geotextile properties for the intended application(s). Test the tensile strength requirements in both machine and cross-machine directions.

END OF SECTION

PART 1 GENERAL**1.1 SCOPE:**

- A. This item includes the work necessary for providing a gravel base for one or more courses of aggregates, as subbase, base, pipe foundation, pipe bedding, pipe zone and/ or trench backfill.

1.2 DEFINITIONS:

- A. **UNDERDRAIN GRAVEL** - Underdrain gravel, usually wrapped in geotextile fabric, is specifically graded rock (pea-gravel) to allow flow as for french-drains, and/or perforated pipe drains, etc.
- B. **BASE AGGREGATES** - Base aggregates are defined as crushed, dimensional rock as specified for use in subbase, base course, leveling course, trench foundation stabilization, trench foundation, pipe bedding, pipe zone, and/or trench backfill.
- C. **SUBGRADE STABILIZATION** - Subgrade stabilization is defined as the zone of material, engineered fill, which makes up the foundation due to liquefaction caused by high pore water pressure found in an excavation, which is to be built upon.
- D. **LOOSE RIP RAP** – Specified classes of graded rock placed on prepared slope, riprap geotextile or filter blanket as specified.
- E. **KEYED RIPRAP** – Loose riprap placed on prepared slope, riprap geotextile, or filter blanket as specified and keyed in place by slapping the surface with a piece of armor plating.
- F. **GROUTED RIPRAP** – Loose riprap with all or part of the spaces filled with Portland cement mortar.

1.3 CERTIFIED SOURCE SUPPLIER:

- A. The Contractor shall ensure that his aggregate supplier is certified by the city as an acceptable source.
- B. Any material supplier may become a certified supplier by providing the City Engineer a copy of lab results, from a certified lab, which show that material meets specifications herein.
- C. The Contractor may use any previously certified source supplier on file with the city. The city reserves the right to bestow or revoke certification of any supplier the Engineer deems to meet the standard.

PART 2 PRODUCTS**2.1 UNDERDRAIN GRAVEL:**

- A. Drain rock shall be clean, crushed or uncrushed gravel specially graded and wrapped in filter fabric, unless otherwise specified and have the following gradation;

TABLE B-1

<u>SIEVE SIZE PASSING</u>	<u>PERCENT PASSING</u>
3/8"	100
No.4	54 to 82
No.10	34 to 56
No.40	9 to 17
No.100	0 to 3

2.2 BASE AGGREGATES:

- A. Base aggregates shall consist of crushed gravel or crushed rock, including sand.

2.3 FRACTURE OF GRAVEL:

- A. Material shall be tested in accordance with ODOT TM 213.
- B. Gravel shall have at least one fractured face on 50-percent of the material retained on each sieve size 1.5-inch and above and 70-percent for the material passing the 1.5-inch sieve and retained on each of the sieves down to 1/4-inch.

2.4 DURABILITY:

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

TABLE B-2

<u>TEST</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
Degradation:		
Passing No.20 sieve	ODOT TM 208	30% Max.
Sediment Height	ODOT TM 208	3" Max.
Abrasion:	ODOT TM 211 (AASHTO T 96)	35% Max.

2.5 SAND EQUIVALENT:

- A. Base aggregates to be incorporated in the work shall have a sand equivalent of not less than 30 when tested in conformance with ODOT TM 101, AASHTO T 176, or ASTM D2419.

2.6 LIQUID LIMIT AND PLASTICITY:

- A. Base aggregate shall meet the following requirements.

TABLE B-3**LIQUID LIMIT AND PLASTICITY INDEX VALUES**

<u>Percent of Material Passing No. 40 Sieve</u>	<u>Liquid Limit (Maximum) AASHTO T 89/ ODOT TM 102</u>	<u>Plasticity Index (Maximum) AASHTO T 90/ ODOT TM 103</u>
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.

2.7 SIEVE REQUIREMENTS:

- A. Base aggregates shall conform to the following requirements:

TABLE B-4

GRADING REQUIREMENTS FOR BASE AGGREGATES					
Separated Sizes	2-1/2" minus	2" minus	1-1/2" minus	1" minus	3/4" minus
Sieve Size	Percentage Passing (by weight)				
3"	100				
2-1/2"	95-100	100			
2"	--	95-100	100		
1-1/2"	--	--	95-100	100	
1-1/4:	55-75	--	--	--	
1"	--	55-75	--	90-100	100
3/4"	--	--	55-75	--	90-100
1/2"	--	--	--	55-75	--
3/8"	--	--	--	--	55-75
1/4"	30-45	30-45	35-50	40-55	40-60
No.10	12-27	12-27	14-30	16-33	16-36
No.40	0-16	0-16	3-18	8-24	-16
No.200	0-9	0-9	0-8	0-8	0-10

- B. Sieve analysis shall be conducted in accordance with AASHTO T11 and T27 (ASTM C117 and C136).

2.8 SUBGRADE STABILIZATION MATERIAL:

- A. Subgrade stabilization material is crushed rock, well fractured, and uniformly graded 4-inch minus.
- B. Subgrade stabilization may, at the discretion of the Engineer, require that geotextile fabric be placed on the native subgrade. Geotextile shall conform to specifications in SECTION 2200 "Geotextile Fabrics" of these Specifications.

2.9 RIPRAP – Shall meet the following requirements;

A.

MATERIAL TEST	REQUIREMENT
Apparent Specific Gravity (AASHTO T85)	2.5 Min.
% Absorption (AASHTO T85)	6.0 Max.
Degradation (ODOT TM 208A) Passing 850µm Sieve Sediment height	35.0% 200 mm Max.
Soundness (ODOT TM206) Avg. loss of 63mm – 37.5mm and 37.5mm – 19.0mm fraction after 5 alterations	16.0%

- B. Gradation Requirements – Control of gradation will be by visual inspection. Any difference of opinion between the Engineer and the Contractor shall be resolved by dumping and checking the gradation of two random truck loads (chosen by the Engineer). Mechanical equipment, a sorting site and labor needed to assist in checking gradation shall be provided by the Contractor at no expense to the Owner. Gradation by Class shall be as shown in the Table below.

CLASS 25	CLASS 50	CLASS 100	CLASS 350	Percent (by mass)
SIZE OF ROCK (kg)				
25-15	50-30	100-65	350-250	20.0
15-7	30-12	65-35	250-100	30.0
7-1	12-1	35-5	100-10	40.0
1-0	1-0	5-0	10-0	10. - 0
<i>Uniformly grade each load of riprap from the smallest to the largest size specified.</i>				

- C. Grouted Riprap shall conform to Section 2300 (2.9)(A)(B) with the addition of portland cement grout as specified in Section 2050 (2.5).

PART 3 EXECUTION

3.1 STOCKPILING:

- A. The materials to be furnished in stockpiles shall be of the kinds, sizes and quality specified. Each designated size of material shall be placed in a separate stockpile.
- B. Stockpiles shall be no more than 8-feet high with side slopes of 1.5:1 horizontal to vertical. The method used in placing the material in the stockpile shall be such as to minimize segregation of the aggregate particles.

3.2 MIXING:

- A. The materials shall be mixed until well blended. The Contractor shall add water during mixing in an amount sufficient to provide optimum moisture content plus or minus 2-percent.
- B. Base or subbase material shall be mixed by one of the following methods:
 - 1. Stationary Plant Method - Materials mixed by means of a pug mill or other type of mixer, transported to the project at proper moisture content and placed by and aggregate spreader.
 - 2. Travel Plant Method - Materials mixed and placed on the project in a continuous operation.
 - 3. Road Mix Method - Materials mixed on the project by motor graders or other approved equipment.

3.3 WEATHER LIMITATIONS:

- A. When, in the judgment of the Engineer, weather conditions will be detrimental to the work, the Contractor shall suspend operations until the weather is favorable.

3.4 EQUIPMENT:

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

3.5 THICKNESS OF LIFTS:

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

3.6 COMPACTION:**A. EQUIPMENT.**

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

B. DENSITY.

- 1. During compaction, materials shall be maintained within 2-percent of the optimum moisture content.

2. The Contractor shall begin compaction of each layer immediately after the material is spread and continue until a density specified has been achieved. Maximum density will be determined by AASHTO T-180 or ASTM D 1557 method.
3. If the specified compaction is not obtained, the Contractor shall notify the Engineer. The Contractor may be required to use a modified compaction procedure or apply additional compactive effort. If approved materials meeting the specifications cannot be compacted to the required density regardless of compactive effort or method, the Engineer may reduce the required density or direct that alternate materials be used. In no case shall aggregate placement proceed until the Contractor is able to compact the material to the satisfaction of the Engineer.

C. SURFACE TOLERANCE.

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

3.7 MEASUREMENT AND PAYMENT:

- A. When listed in the Form of Proposal as a separate bid item aggregates will be field measured and paid for by the unit price in the bid proposal to the nearest 0.1-CY or Ton.
- B. When required as a component in another bid item they will be incidental to that bid item.

3.8 SUBMITTAL REQUIREMENTS:

- A. Submit the following as a minimum.
 1. Supplier name address and phone number.
 2. Sieve analysis date, location, testing lab
 3. Source Qualifying Tests;
 - a. Fracture Faces
 - b. Durability
 - c. Sand Equivalent
 - d. Liquid Limit
 - e. Plastic Index
 4. AASHTO T-180 density and optimum moisture.

PART 4 TESTING

4.1 GENERAL:

- A. At the direction of the Engineer the Supplier shall make his aggregate material available to the Engineer's testing laboratory to retrieve an adequate sample, which will be tested for conformance to these Specifications. Testing prior to construction and after award of the Bid, for the purpose of certification, will be paid by the Owner. The Owner will pay for certification of the low bidder on a city-funded project only.

4.2 MATERIAL QUALITY:

- A. At the direction of the Engineer a sample of the material shall be taken, in accordance with AASHTO T2 or ASTM D75, and tested by a qualified/certified laboratory for fractures, durability, sand equivalent, liquid limit, gradation, and plasticity. The Engineer reserves the right to request any test to ensure the quality of materials on the Project.
- B. The material shall be within the acceptable limits as set forth herein.

4.3 GRADATION:

- A. At the direction of the Engineer a sample of in-place material shall be taken and tested by a qualified/certified laboratory for gradation in accordance with AASHTO T-27, ASTM D422. Gradations shall be within tolerances of these specifications.

4.4 MOISTURE-DENSITY:

- A. The Engineer may test in-place material for compaction and moisture content to be in conformance with these specifications. In-place moisture shall be tested in accordance with ASTM D2922 (AASHTO T 238) and ASTM D3017 (AASHTO T 239) for density
- B. Testing will be done by an independent certified laboratory at no cost to the Contractor for the first test. If the material fails to meet the specified requirements and additional testing is required, the cost will be at the sole expense of the Contractor.

4.5 SURFACE TOLERANCES:

- A. When directed by the Engineer, the surface shall be tested with a 12-foot straightedge. The surface shall not vary more than outlined in (3.6)(C). The Engineer will observe this testing and may require additional testing.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This work consists of establishing the JMF for HMAC for use in road and street constructions and/or repairs. Once established and accepted the JMF will be used to determine acceptance of the end product along with in-place testing.

1.2 DEFINITIONS:

- A. **HOT MIX ASPHALT CONCRETE (HMAC)** - Asphalt concrete is a hot mixture of asphalt cement; well graded, high-quality aggregate; and mineral filler and additives as required; plant mixed into a uniformly coated mass, hot laid on a prepared base, and compacted.
- B. **RECYCLED ASPHALT PAVEMENT (RAP)** - RAP is processed recycled asphalt pavement material used in the production of new asphalt concrete pavement. The RAP materials proposed for use in the recycled mix shall contain hard, sound, durable aggregates and asphalt cement.
- C. **JOB MIX FORMULA (JMF)** – Mix design prepared by a certified, ODOT recognized lab, submitted to the Engineer by the Contractor for approval for use on contracted paving project.

PART 2 PRODUCTS

2.1 GENERAL:

- A. The asphalt concrete mixture shall be a well-graded, uniform, durable mix of the class as shown on the Plans or approved by the Engineer. The components shall be within the broadband limits set forth in the following table unless modified by the job mix formula, see 2.8 Job Mix Formula.

TABLE A-1			
Passing Sieve Size	Broadband Limits		
	Pct. Passing by Wt. Total Aggregate		
	Class B	Class C	Class D
1-inch	99-100	----	----
¾-inch	90-98	99-100	----
½-inch	75-91	90-100	99-100
¼-inch	50-70	52-80	85-100
No. 10	21-41	21-46	37-57
No. 40	8-24	8-25	13-29
No. 200*	2-7	3-8	4-9
Asphaltic Cement**	4-8	4-8	4-8

* Include lime or cement filler. When treatment of aggregate with lime is required, the percentage passing the No.200 sieve will be increased by 0.5 percent.

** Percent of total mix by weight. The amount of new asphalt cement to be added to the recycled mixture will vary from 3 to 8 percent.

2.2 ASPHALT CEMENT:

- A. ASPHALT CEMENT - New asphalt cement shall be PBA-2 or PBA-5 and meet ODOT requirements pursuant to Section 02710 (latest revision).
- B. ASPHALT CEMENT ADDITIVES - Anti-stripping additives ordered and/or approved by the Engineer shall be added to the asphalt cement and shall meet the requirements of the ODOT Standard Specifications.

2.3 AGGREGATES:

A. GENERAL.

- 1. Aggregates shall be hard, sound, durable, and free of deleterious substances.
- 2. The Contractor shall modify or adjust crushing and screening operations as necessary to produce materials meeting the specifications. During production of aggregates, samples of each size shall be provided as frequently as the Engineer considers necessary to determine conformance to the specifications.
- 3. The aggregate shall be stockpiled and removed from stockpiles in a manner that will minimize segregation.

B. FRACTURE OF GRAVEL.

- 1. A minimum of 75-percent of crushed gravel retained on the ¼-inch sieve shall have two fractured faces. A minimum of 75 percent of the material passing the ¼-inch sieve but retained on the No.10 sieve shall have one fractured face. All aggregate shall conform to ODOT TM 213.

C. SAND EQUIVALENT.

- 1. Sand equivalent shall be not less than 30 when tested in accordance with ODOT TM 101.

D. DURABILITY.

- 1. The material from which the aggregates are produced and the crushed aggregates shall meet the following test requirements

TABLE A-2			
TEST	TEST METHOD	MAXIMUM VALUES	
		Coarse Aggregates	Fine Aggregates
Soundness (5 cycles)	ODOT TM 206	12%	12%
Degradation Passing No.20	ODOT TM 208	30%	30%
Degradation Sediment Height	ODOT TM 208	3"	4"
Abrasion	ODOT TM 211	30%	--

E. DELETERIOUS SUBSTANCES

1. The aggregates shall be free from all other deleterious substances such as soft or disintegrated pieces, clay, loam, or vegetative matter, either in a free state or adherent to the aggregate.
2. The amount of deleterious substances in each test fraction of the crushed aggregate material shall not exceed the following values.

TABLE A-3		
TEST	TEST METHOD	MAX. PERCENT (by wt.)
Lightweight Pieces	ODOT TM 222	1.0
Wood Particles	ODOT TM 225	0.1
Friable Particles: Coarse Aggregate	ODOT TM 221	1.0
Friable Particles: Fine Aggregate	ODOT TM 221	2.5
Flat & Elongated Pieces: Coarse Aggregate	ODOT TM 229	5.0

F. COARSE AGGREGATE GRADING – STOCKPILE SEPERATED SIZES

1. That portion of the aggregate retained on a 1/4-inch sieve with allowable undersize will be known as coarse aggregate and shall be crushed gravel.
2. The grading of the separated sizes of coarse aggregate shall conform to the following target values.

TABLE A-4						
SEPARATED SIZES – (Percentage by weight)						
Sieve Size Passing	<u>3/4" to 1/4"</u>		<u>3/4" to 1/4"</u>		<u>1/2" to 1/4"</u>	
	<u>Target Value</u>	<u>Tolerance +/-</u>	<u>Target Value</u>	<u>Tolerance +/-</u>	<u>Target Value</u>	<u>Tolerance +/-</u>
1-inch	100	0	100	0	--	--
3/4-inch	90	5	75	7	100	-1
1/2-inch	60	8	8	8	95	5
1/4-inch	8	8	7	7	8	8
No.10	5	5	5	5	5	5
No.40	3	2	3	3	3	3
No.200	1	1	1	1	1	1

G. FINE AGGREGATE GRADING – STOCKPILE SEPERATED SIZES

1. That portion of the aggregate passing the 1/4-inch sieve with allowable oversize shall be known as fine aggregate and shall consist of finely crushed rock or finely crushed gravel and fine sand. No more than 15 percent by weight of natural uncrushed material passing the No.10 sieve shall be re-blended into the total fine aggregate
2. The grading of the fine aggregate shall conform as closely as possible to the following target values.

TABLE A-5						
Separate Sizes (Percentage of Weight)						
Sieve Size Passing	<u>1/4" to 0"</u>		<u>1/4" to No.10</u>		<u>No.10 to 0"</u>	
	<u>Target Value</u>	<u>Tolerance +/-</u>	<u>Target Value</u>	<u>Tolerance +/-</u>	<u>Target Value</u>	<u>Tolerance +/-</u>
3/8 inch	100	- 1	100	-1	--	--
1/4 inch	93	7	90	10	100	-1
No.10	--	--	10	7	90	10
No.40	--	--	5	5	37	8
No.200	--	--	2	2	12	4

2.4 RECYCLED AGGREGATES:

- A. Recycled material used in the asphalt concrete pavement shall have a maximum size of 1-inch prior to entering the cold feed. Any recycled material larger than 1-inch shall be separated by screening or broken down by mechanical means to pass a 1-inch sieve and reincorporated with the balance of the recycled material to form a mixture acceptable to the Engineer
- B. The recycled material shall be blended with new aggregate to provide a mix conforming to the job mix formula. If there is evidence that the recycled material is not breaking down during the heating and mixing of the asphalt concrete mixture, the Engineer may elect to modify the maximum size requirement. The fraction of recycled material in the new pavement shall not exceed 20-percent of the total aggregate by weight.

2.5 PORTLAND CEMENT AND HYDRATED LIME:

- A. Portland cement filler shall meet the requirements of the ODOT Standard Specifications. Hydrated lime used as filler or used to treat aggregates shall meet the requirements of AASHTO M 216, Type 1, Grade A. The Contractor shall furnish manufacturer's certifications in conformance with submittal requirements of the Special Provisions.

2.6 MINERAL FILLER:

- A. Mineral filler shall meet the requirements of AASHTO M17.

2.7 TEMPORARY SURFACING:

- A. Asphalt concrete mixture for temporary surfacing, which is not to become a part of the final pavement, shall be a well-graded, uniform durable mix using all new materials or a combination of new materials and R.A.P. The allowable percentage of R.A.P. in the temporary surfacing shall be determined through an approved mix design.
- B. The components of the mixture shall be within the broadband limits specified in Table A-1.
- C. The mixture will be accepted on the basis of testing for each 200-tons of mixture or by other testing the Engineer deems necessary to ensure the mixture is appropriate for the intended use.

2.8 JOB MIX FORMULA:

- A. The Contractor shall furnish a job mix formula for the approval of the Engineer or may propose the use of a current job mix formula on file with the Owner or with ODOT. A job mix formula will be required for each aggregate source.
- B. If a job mix formula is not approved by the Engineer, then a new job mix formula will be established at the Contractor's expense.

2.9 TOLERANCES:

- A. After the job mix formula is determined, the mixture shall conform to the formula within the following tolerances:

TABLE A-7		
Passing Sieve Size	Leveling Course (+/-)	Base and Surface Course (+/-)
1", ¾", ½"	Limits as indicated on Table A-1	
0.25"	7.0	6.0
No. 10	5.0	4.0
No. 40	5.0	4.0
No. 200	2.0	2.0
AC	0.60	0.50
Moisture Content	0.60	0.60

2.10 MODIFICATION OF MIXES:

- A. The Engineer reserves the right to modify specified mixes for use under various traffic conditions on various segments of the work and for feathering, spot patching, and other special purposes. The Contractor shall provide mixes proportioned as directed the Engineer for such purposes.
- B. Modifications of the mix as directed may require changes in the Contractor's plan and sequence of operations.
- C. Upon written request from the Contractor, the Engineer may approve field adjustments to the job mix formula. Adjustments to the job mix formula may be made by the Engineer provided the change will produce material of equal or better quality. Any adjustments ordered by the Engineer, will be considered the job mix formula.

PART 3 EXECUTION

3.1 ASPHALT CONCRETE MIXING PLANT:

- A. **DEQ REQUIREMENTS** – HMAC products shall be supplied from and produced at plants which comply fully with DEQ "Current air contaminate" limits under a current permit from DEQ. A copy of the permit shall be available to the Engineer at his request.
- B. **PLANT SCALES** - Scales shall be accurate to 0.5-percent throughout the range of use and shall be tested and adjusted as often as directed by the Engineer to verify continued accuracy.
- C. **PLANT ACCESS** – Mixing plant shall be accessible to inspection by the Engineer prior to or during production of the JMF. Plant process shall be of quality and quantity to ensure adequate mixing and delivery of the JMF as specified and is subject to the opinion of the Engineer.

3.2 DRYING AND SEPARATING AGGREGATES INTO DESIGNATED SIZES:

- A. DRYING - Aggregates shall be dried to the extent that any retained moisture will not result in visible defects in the mixture such as slumping loads, boils, or slicks.
- B. SCREENING - In plants which have screens, the aggregates shall be separated, immediately after drying and heating, by screening in to the sizes required for separate handling, storing and proportioning at the mix plant.

3.3 HEATING ASPHALT CEMENT:

- A. Asphalt heating equipment shall be capable of uniformly heating the asphalt cement to the temperature specified and in accordance with the manufacturer's recommendations.

3.4 MIXING:

- A. All the components of the asphalt concrete mixing plant shall be utilized and operated in a manner to ensure compliance with this section. The Combined materials shall be mixed until asphalt cement is distributed thoroughly in the mixture and the aggregate particles are completely and uniformly coated.
- B. The moisture content of the mix shall not exceed 0.60-percent at time of discharge from the mixing plant.
- C. The temperature of the mix at discharge from the plant shall not exceed 325⁰ F.

3.5 MEASUREMENT AND PAYMENT:

- A. HMA will be paid for at the unit price as accepted in the Proposal for the type of application and/or class of AC supplied per the specification section that applies.

3.6 SUBMITAL REQUIREMENTS:

- A. Submit the following as a minimum;
 - 1. Name, address and phone number of HMA supplier
 - 2. DEQ Air Quality Certification.
 - 3. JMF, including the following;
 - a. 5 point Marshall curves for
 - Stability vs AC Content
 - Flow vs AC Content
 - Unit Weight of total mix vs AC Content
 - Pct. Air Voids vs AC Content
 - Pct. VMA vs AC Content
 - b. Additives

4. Aggregate Source Qualifying Test, including the following;
 - a. Sodium Sulfide Soundness
 - b. Degradation
 - c. Abrasion
 - d. Fractures
 - e. Sand Equivalent
 - f. Deleterious Substances
 - g. Percent Moisture Absorption of Aggregates
 - h. Gradation Sieves

PART 4 TESTING

4.1 SAMPLING AND TESTING:

- A. The Contractor shall make the plant available for inspection and sampling to ensure, to the satisfaction of the Engineer, that mix approved in the JMF can be adequately supplied.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section describes allowable pipe and fittings materials for use in construction of water, wastewater and storm water projects.

1.2 MANUFACTURE:

- A. All material shall be new and of U.S. manufacture including valves, pipe, fittings and etc. unless approved prior to installation, through the submittal process.

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE & FITTINGS:

- A. CLASS - Pipe and fittings shall be Class 52 for all ductile iron pipe & fittings.
- B. LINING & COATING - Ductile iron pipe shall be cement-mortar lined and seal-coated and shall conform with ASTM C536, AWWA C151, AWWA C104, and AWWA C111, as manufactured by Pacific States Pipe (503.690.4948), US Pipe (503.241.8347) or approved equal.
- C. JOINTS - Ductile iron pipe shall be constructed with Tyton joints, or equal, for pipe runs up to but excluding fittings where mechanical joints shall be used as specified. Joint lubricant, when required, shall be in accordance with the pipe or joint manufacturer's recommendations and shall be water soluble and non-toxic. Lubricant as produced by Black Swan Manufacturing Co. (312.227.3700) or equal will be accepted. Rubber gasket joints shall be standard SBR gaskets in conformance with AWWA C111/A21.11.
- D. FITTINGS AND APPURTENANCES -

1. SERVICE LINES

Each individual water service connection shall be equipped with the appropriately sized pipe and brass stops as shown on Standard Details.

All water service pipelines shall be seamless copper (Type K) tubing conforming to ASTM B88 for potable water transmission. No service pipe shall be smaller than 1-inch in diameter.

2. ANGLE METER VALVE STOPS

Angle meter valves shall be 1-inch minimum, lock wing style, bronze body conforming to AWWA C800. Inlets shall be compression fitting and accept copper tubing and outlets shall be meter swivel nut. Angle meter valves shall be as manufactured by Ford Co., model No. KV43-444W, or equal.

3. CORPORATION STOPS

Full way bore corporation stops shall be bronze body, 1-inch minimum size conforming to AWWA C 800 and have Mueller CC thread male inlet and compression outlet sized for seamless copper (Type K) tubing. Corporation stop(s) shall be as manufactured by Ford Co., model No.F-1000-4, or equal. Direct corporation taps can be made on the following ductile iron pipe sizes. All other sizes shall be saddle tapped. Refer to Table B-2.

TABLE B-2			
<u>DIA.</u>	<u>TYPE</u>	<u>CLASS</u>	<u>TAPPING SERVICE DIMENSIONS</u>
4"	D.I.	52	Saddle
6" & Larger	D.I.	52	Direct Tap

4. SADDLES

Saddles shall be all brass (body, straps, nuts and bolts) be of the double strap type with iron pipe threads and be of Ford or Romac manufacturer or equal. Straps may be bronze if approved prior to installation. Saddle shall be equipped with a gasket of Buna-N rubber conforming to ASTM D2000.

5. NUTS, BOLTS, AND WASHERS

Nuts, bolts and washers shall be ductile iron or zinc coated steel. Zinc coating shall be by the hot-dip process and shall conform to ASTM B6.

E. DUCTILE IRON RESTRAINED JOINT PIPE -

1. When allowed, mechanical joint restraint shall consist of individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial.
2. The joint restraint ring and its wedging components shall be made of grade 60-42-10 ductile iron conforming to ASTM A536. Wedges shall be ductile iron heat treated to a minimum hardness of 370-BHN.
3. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 nuts shall be used to insure proper actuation of the restraining wedges.
4. Restrained joint shall have a rated working pressure of 350-psi in sizes less than and up to 16-inch dia. and 250-psi for sizes 18-inch dia. and above. Device shall be UL and/or Factory Mutual (FM) approved.

5. Restrained joint shall be as manufactured by MEGALUG™ Series 1100, or equal.

2.2 POLY-VINYL CHLORIDE (PVC) PIPE AND FITTINGS:

- A. Pipe materials under this item shall be PVC and in conformance with ASTM D3034 (for less than 18-inch diameter) and/or ASTM F679 (for 18-inch and greater diameter).
- B. Tees and wyes for service laterals shall be furnished by the pipe manufacturer and shall be of the same size and class as the sewer pipe runs in which they are installed. Branches shall be 4-inch diameter minimum for service laterals. All branches shall be provided with plugs or caps on the branch.
- C. Gaskets shall conform to ASTM D1969.

2.3 PVC PROFILE PIPE AND FITTINGS:

- A. Profile pipe shall be ASTM F794 and have a minimum wall stiffness of 46-psi and conform to wall thickness T-1 in the Uni-Bell Handbook.
- B. Tees and wyes for service laterals shall be furnished by the pipe manufacturer and shall be of the same size and class as the sewer pipe runs in which they are installed.

2.4 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS:

- A. HDPE pipe shall meet the applicable requirements of ASTM D3550.
- B. The minimum SDR shall be 17.
- C. Each length of pipe and fitting shall be marked by the manufacturer with trade name, nominal size, the ASTM Specifications number, and the type and grade.

2.5 COUREGATED POLYETHYLENE (PE) PIPE AND FITTINGS:

- A. Corrugated PE pipe and fittings shall conform to AASHTO M294, Type S or D.

2.6 NONREINFORCED CONCRETE PIPE AND FITTINGS:

- A. Nonreinforced concrete pipe shall conform to ASTM C14, latest edition, of the class shown on the Plans. Pipe shall be furnished with a rubber gasket type joint, similar to the Brant joint or approved equal. The rubber gaskets shall be manufactured in conformance with ASTM C443.
- B. Tees and wyes for service laterals shall be furnished by the pipe manufacturer and shall be of the same size and class as the sewer pipe runs in which they are installed

2.7 REINFORCED CONCRETE PIPE AND FITTINGS:

- A. Reinforced concrete nonpressure pipe shall conform to the requirements of ASTM C76 or C655. The pipe shall meet the design requirements of wall B.
- B. Reinforced concrete low-head pressure pipe shall conform to the requirements of ASTM C361.
- C. Tees and wyes for service laterals shall be furnished by the pipe manufacturer and shall be of the same size and class as the sewer pipe runs in which they are installed.
- D. Gaskets shall conform to the requirements of ASTM C443.

2.8 GALVANIZED CORRUGATED STEEL PIPE AND FITTINGS:

- A. Galvanized corrugated steel pipe and fittings shall conform to the requirements of AASHTO M36 or M167.
- B. The surfaces of corrugated steel pipe shall be completely coated with bituminous material conforming to AASHTO M190, with a minimum thickness of 0.05-inch at the crest of the corrugations.

2.9 CORRUGATED ALUMINUM ALLOY PIPE AND FITTINGS:

- A. Corrugated aluminum alloy pipe and fittings shall conform to the requirements of AASHTO M196, M197, M211, and M219.

PART 3 EXECUTION**3.1 PIPELINE CONSTRUCTION:**

- A. Pipeline construction shall be as specified for the end use and as outlined in Sections 5000 "Waterline Installation", 6200 "Sanitary Sewer Installation" and 7000 "Storm Sewer Installation".

3.2 MEASUREMENT AND PAYMENT:

- A. Measurement for pipe will be to the nearest 0.1 LF as field measured for the type, class, diameter and use of pipe installed and particularly as set forth in the specification for type of installation (i.e. water, sanitary and/or storm).

PART 4 TESTING**4.1 GENERAL:**

- A. Testing of pipe shall be accomplished on per lot basis as specified in the referenced ASTM for pipe material specified and certification of results shall be submitted to the Engineer when requested.
- B. Testing of constructed pipelines shall be as specified in the technical specification(s) for the end

use.

END OF SECTION

DIVISION 3 – SITE WORK

<u>SECTION</u>	<u>DESCRIPTION</u>
SEC. 3000	Mobilization
SEC. 3100	Earthwork
SEC. 3200	Clearing and Grubbing
SEC. 3300	Temporary Traffic Control
SEC. 3400	Adjustment of Structures to Grade
SEC 3600	Landscaping
SEC. 3700	Cleanup
SEC. 3800	Trenching and Backfill
SEC. 3900	Erosion Prevention and Sediment Control

PART 1 GENERAL

1.1 SCOPE:

- A. This section covers, but is not limited to, work necessary to move in personnel and equipment; set up all offices, buildings, and facilities; install project signs (when required), perform other work, operations or incur costs in preparation for construction work.

PART 2 PRODUCTS

2.1 GENERAL:

- A. Provide all materials required to accomplish the work as specified.

PART 3 EXECUTION

3.1 GENERAL:

- A. 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 the "GENERAL CONDITIONS" and "GENERAL SPECIFICATIONS" including but not limited to Permits and Licenses, Facilities and Sanitation, Safety Precautions, Protection of Property, Materials and Appliances, Beginning of Work, Schedules and Progress Reports, Staking out of Work, and Interfering Structures and Utilities.

3.2 MEASUREMENT AND PAYMENT:

- A. Payment for the item Mobilization will be the contract lump sum amount.
 - 1. 50% of the lump sum bid amount of Mobilization will be paid (minus retainage requirement) when 5% of the total contract amount has been earned.
 - 2. 100% of the lump sum bid amount of Mobilization will be paid (minus retainage requirement when 10% of the total contract amount has been earned.

3.3 SUBMITTALS:

- 1. Submittals shall be as marked in "Appendix A".

PART 4 TESTING - NOT USED

END OF SECTION

PART 1 GENERAL**1.1 SCOPE:**

- A. This work consists of excavation and grading for streets, sidewalks, planting areas, cuts, embankments, slopes, ditches, driveways, and all other earth moving work required in construction of the project, including disposal of surplus material.
- B. Excavation and grading specified as incidental to work items in other sections of these specifications will not be included in this section.

1.2 DEFINITIONS:

- A. **UNCLASSIFIED EXCAVATION** - Unclassified excavation is defined as all excavation regardless of the type, nature, or condition of the materials encountered.
- B. **RELATIVE COMPACTION**: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D 1557 ASSHTO T-180 directed by the engineer.
- C. **OPTIMUM MOISTURE CONTENT**: Determined by the ASTM D 2216 standard specification to determine the maximum dry density for relative compaction.
- D. **PERMITTED LANDFILL** - A permitted landfill is defined as any solid waste landfill which has been approved and granted a permit for receiving the type(s) of material being deposited, from the Agency having jurisdiction.
- E. **CONTROLLED DENSITY FILL (CDF)**: A rippable, cementuous, mineral and water mixture placed in an open excavation in lieu of aggregate or soil backfill, and as specified.

1.3 SITE CONDITIONS:

- A. Submission of a Proposal shall be conclusive evidence that the Bidder has investigated the site and is satisfied as to the conditions to be encountered, the character, quality and quantity of work to be performed to complete the construction as specified.

PART 2 PRODUCTS**2.1 BORROW AND EMBANKMENT MATERIALS:**

- A. The Contractor shall provide embankment and borrow materials of approved earth, sand, gravel or rock, or combination thereof, free of peat, humus, muck, vegetative matter, organic matter or other materials detrimental to the construction of firm, dense, and sound embankment.

2.2 CONTROLLED DENSITY FILL (CDF):

- A. Controlled density fill (CDF) shall be as specified in Section 2050 CEMENTIOUS PATCHING & GROUTING MATERIALS.

2.3 AGGREGATE FILL:

- A. Imported aggregate fill shall be of the class, type, and designated gradation specified on the plans and shall otherwise conform to Section 2300 AGGREGATES.

PART 3 EXECUTION**3.1 PRESERVATION OF EXISTING IMPROVEMENTS:**

- A. The Contractor shall conduct operations in a manner that will protect any and all existing facilities in accordance with Article E(8) of the General Conditions and as directed by the Engineer.

3.2 EXCAVATION OF EXISTING FACILITIES:

- A. The Contractor shall remove remaining ends of abandoned pipes or portions of other items partially removed under this work, which would be left, exposed on side slopes or at subgrade, to a minimum of 1-foot beyond or below the finished slope or subgrade. Abandoned pipes shall be capped or plugged watertight.

3.3 OVER EXCAVATION:

- A. The Contractor shall remove unsuitable subgrade material as directed. Excavation below subgrade shall be of the same classification as that above subgrade provided it is removed in the same operation as the excavation above subgrade. When the street excavation has been completed and it is required to move equipment in to excavate unsuitable material, or where special equipment is required, the work shall be performed as directed and will be paid for as over excavation.
- B. Excavation made below grade without authorization shall be restored to grade by the Contractor, as directed, at no expense to the Owner.
- C. The Contractor shall remove any material which is excavated, displaced, or loosened outside and beyond the required slopes, lines, or grades, regardless of whether the over break is due to blasting, to the inherent character of any formation encountered, or to any other cause. Removal and disposal of over break, and replacement with approved materials, shall be by the Contractor at no expense to the Owner except in cases where the Engineer determines that such over break was unavoidable.

3.4 USE OF EXPLOSIVES:

- A. Blasting is prohibited unless approved in writing from the Engineer.

3.5 EMBANKMENT CONSTRUCTION:

- A. Embankment construction shall include preparation of the areas upon which embankments are placed, construction of dikes, and the placement and compaction of approved embankment

material for replacement of unsuitable material and filling of holes, pits, and other depressions within the street area.

- B. The Contractor shall place embankments and fills in horizontal layers of 8-inches maximum depth and compact each layer to the density specified.
- C. In the immediate vicinity of curbs, walks, driveways, inlets, manholes and similar structures, in holes, and where the normal compacting equipment cannot reach embankment and fill materials, the Contractor shall compact to specified density by approved methods.
- D. When the excavated material is predominately of rock too large to be placed in the thickness prescribed, the material may be placed in thickness up to the average rock dimension not to exceed 3-feet. Each layer will be leveled and smoothed by distribution of spalls and finer fragments or earth.
- E. Where end dumping is employed, direct end dumping on the previously constructed layer of embankment will not be permitted. Rock shall be dumped on the layer of embankment being constructed and dozed ahead into place. The large rock shall not be placed where it will project above an elevation 2-feet below the finished grade.
- F. When a rock fill is placed over any structure, the structure will be covered and compacted with a minimum of 2-feet of earth or other approved material before the rock is placed.
- G. Embankments shall not be constructed when the embankment material or the foundation on which the embankment would be placed is frozen.

3.6 LINE AND GRADE:

- A. Finished line and grade shall be compacted, smooth and free of irregularities and within plus or minus 0.05-feet of that shown on the plans for soil and aggregate grading.

3.7 COMPACTION:

- A. The density of compacted materials in place will be 95-percent of AASHTO T-180 or as specified on the Plans or in the Special Provisions.
- B. The Contractor shall water the materials to provide optimum moisture for compaction of embankments and backfills. Embankment or backfill materials shall not be placed in final position until moisture in excess of optimum moisture has been removed. Field moisture content shall be tested in accordance with ASTM D 3017.
- C. If approved materials meeting the specifications cannot be compacted to the required density regardless of compactive effort or method, the Engineer may reduce the required density or direct that alternate materials be used. In no case shall earthwork operations proceed until the Contractor is able to compact the material to the satisfaction of the Engineer.

3.8 DISPOSAL OF EXCAVATED MATERIAL:

- A. Excavated material in excess of that needed to complete the work shall be disposed of at no expense to the Owner.
- B. All waste material shall be deposited in an approved and/or "Permitted" landfill as defined herein.

3.9 DEWATERING:

- A. Dewatering shall conform to the requirements as outlined in Article H.6 of the General Conditions of the City of Woodburn, OR.

3.10 SHORING:

- A. Shoring, sheeting and bracing of trenches and pits shall conform to Article H.5 of the General Conditions of the City of Woodburn, OR.

3.11 MEASUREMENT AND PAYMENT:

- A. Items will be paid based upon the unit price in the Bid and as measured in the field. If no Bid Item exists for this type of work it is considered incidental to the work.

PART 4 TESTING**4.1 EMBANKMENT AND BORROW MATERIAL:**

- A. At the direction of the Engineer a sample of the material shall be taken and tested by a qualified testing laboratory for gradation.
- B. The Engineer may test material for density and moisture content of in place material.
- C. Line and grade shall be checked by the Engineer prior to approval of any completed lift of embankment material before the next or differing material can be placed.

4.2 CONTROLLED DENSITY FILL (CDF):

- A. CDF shall be tested in conformance with ASTM D4832, latest revision.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. 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 area.
- B. Clearing is defined as cutting of trees, brushes, vines, and other vegetative growth at or above ground surface and removal from the site of all such cut or down vegetation.
- C. Grubbing is defined as removal of vegetation growth and natural wooden items remaining at or below ground surface following the clearing operation.
- D. Review with the Engineer the location, limits, and methods to be used prior to commencing work under this Section.
- E. 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.

PART 2 PRODUCTS

2.1 GENERAL:

- A. All equipment shall be in good working condition and safe to operate in Public Rights-of-Way.
- B. Explosives shall not be allowed for grubbing work unless the following conditions can be proved to the Engineer.
 - 1. Blasting will in no way pose any danger to people, structures, utilities, etc., in, around, under, and/or adjacent to the project area.
 - 2. Blasting is cost effective to the Owner and will comply with condition No.1.
 - 3. The Contractor can prove he is insured to cover the proposed demolition and has met conditions No.1 and No.2.
 - 4. The Contractor, or his subcontractor, can supply a resume' of prior work using the proposed explosives in a safe manner.

PART 3 EXECUTION

3.1 GENERAL:

- A. All trees, designated to be removed, shall be considered salvage for the Contractor.

3.2 PROTECTION OF EXISTING VEGETATION:

- A. Protect all trees, shrubbery, and other vegetation, not designated for removal, from damage caused by the work. Cut and remove tree branches only where approved. When directed, remove branches other than those required to provide a balanced appearance of any tree. Seals from removal of branches shall be treated with an approved tree sealant.

3.3 CLEARING:

- A. Clear all area above the natural ground surface of all vegetable growth and objectionable materials, and cut timber and timber growth so that no stump extends above ground surface more than 6-inches.
- B. Stockpile all material free of roots, vines, branches, and the like that may be used as unclassified backfill.

3.4 GRUBBING AND STRIPPING:

- A. 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.
- B. 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.

3.5 DISPOSAL OF WASTE MATERIAL:

- A. Remove and dispose of all waste materials of 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.

3.6 BACKFILLING AND CLEAN-UP

- A. In areas not subject to future excavations or filling, fill all holes and depressions caused by clearing and grubbing with material acceptable to the Engineer and reshape area to conform to adjacent undisturbed topography.
- B. Leave work area in a clean condition, free from litter and debris.

3.7 MEASUREMENT AND PAYMENT:

- A. Clearing and grubbing will be paid for at the unit price as in the Bid for the quantity of work accomplished and measured in the field.

PART 4 TESTING

4.1 GENERAL:

- A. The Engineer shall require any testing necessary to ensure work has been performed in the manner specified in accordance with recognized standard testing and lab procedures.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section covers all work, materials, equipment, and labor necessary to conduct construction operations so as to offer the least possible obstruction to the public.
- B. The purpose of traffic control is to make a safe work site for construction crews and to safely convey traffic from one end of the work site to the other and to protect pedestrian traffic during off work hours.
- C. Reference General Conditions, Article E(10).

PART 2 PRODUCTS

2.1 GENERAL:

- A. Provide flaggers, barricades, lights, signs, pilot cars, and/or all traffic control devices necessary to adequately warn the public at all times of existing conditions on all streets within the project construction area by signs and/or door hanger notices.
- B. If the occasion arises that the Contractor should like to change the traffic control plan from that which is shown on the drawings, he shall submit a shop drawing outlining those changes to the Engineer 48-hours in advance of the proposed closure.

PART 3 EXECUTION

3.1 GENERAL

- A. Patrol the project area at the start of every workday to ensure that all signs barricades and traffic control devices are in-place, appropriate, and of sufficient quantity to protect the crew and guide and flow of traffic.
- B. Patrol the work site at the end of the day to ensure proper safety devices are in-place and operating correctly. As well as to ensure that devices no longer in effect are taken down.
- C. The Contractor shall provide the name and phone number of the individual who will be responsible for maintaining traffic control devices during evenings and weekends.
- D. Contractor shall maintain at least one lane of traffic through work zone at all times unless a detour route has been approved per a submitted traffic control plan.

3.2 FLAGGING:

- A. Flaggers shall be certified and have the appropriate temperament for the work. Attacking passing vehicles for any reason is unacceptable and will result in that flagger being bared from the work site.

- B. "FLAGGER AHEAD" sign(s) shall never be in place unless the flaggers are on duty.
- C. Flaggers shall be relieved by another certified flagger only.
- D. Flagging shall be utilized when the crew is placing traffic control devices or removing them.

3.3 TRAFFIC CONTROL DEVICES:

- A. Traffic control devices shall be placed in accordance with the approved traffic control plan and the M.U.T.C.D. as it applies to the project.

3.4 MEASUREMENT AND PAYMENT:

- A. Traffic control will be paid for based upon the unit price as stated in the Bid.
- B. Progress payments will be made based upon the completed percentage of work accomplished.

PART 4 TESTING - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

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

PART 2 PRODUCTS

2.1 GENERAL:

- A. Materials used in adjustment of structures may be materials salvaged from the existing installation and brought to a condition approved for reuse, or materials conforming to the requirements of like material and work referred to herein.

2.2 AGGREGATE BASE:

- A. Aggregate shall conform to the requirements of Section 2300.

2.3 PCC:

- A. PCC shall conform to the requirements of Section 2000.

2.4 HOT MIX ASPHALTIC CONCRETE (HMA):

- A. HMA concrete shall conform to the requirements of Section 2400.

2.5 TACK COAT:

- A. Tack coat shall conform to the requirements of Section 4220.

2.6 MANHOLES AND CATCH BASINS:

- A. Manholes and catch basins shall conform to the following sections;

Sanitary Sewer Clean Outs	Sec. 6200
Sanitary Sewer Manholes	Sec. 6510
Catch Basins	Sec. 7100
Storm Sewer Manholes	Sec. 7500

2.7 CONCRETE GRADE RINGS:

- A. Concrete grade rings or doughnuts, shall be of size shown on plans and be of 3,500-psi concrete, minimum.

2.8 MORTAR & GROUT:

- A. Mortars and grouts used to construct grade adjustments on these structures shall conform to Section 2050 "CEMENTITIOUS PATCHING & GROUTING MATERIALS".

PART 3 EXECUTION**3.1 EXCAVATION:**

- A. Excavation shall be unclassified and include all materials encountered to the depths as shown or as directed.

3.2 SAW CUT:

- A. Saw cut around structure to be adjusted, before new pavement is placed. Do not jack hammer in lieu of saw cut. Replace pavement to previous density and grade.

3.3 BACKFILL:

- A. Backfill shall be accomplished to ensure an equal or better foundation than adjacent foundation structure.

3.4 RAISING TOPS OF MASONRY STRUCTURES:

- A. Remove existing frames, covers, and grates to expose the surface on which new mortar or concrete is to be placed. Chip existing surface to a depth of at least 3/4-inch to firm concrete. This surface shall be cleaned by brushing and water moistened prior to placing new concrete thereon. New concrete shall be cured at least three days, after which the frame shall be seated in fresh mortar and brought to proper grade.

3.5 LOWERING TOPS OF MASONRY STRUCTURES:

- A. 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.

3.6 ADJUSTING METAL STRUCTURES:

- A. Metal inlets, valves boxes, meter boxes, monument boxes, and other like structures shall 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.
- B. Salvaged structures not reused on the project shall become the property of the Owner.

3.7 FRAMES, GRATES AND COVERS:

- A. Frames, grates, and covers meeting specifications shall be installed to accommodate grade changes per the plans and/or grade staking and secured in a workman like manner.

3.8 MEASUREMENT AND PAYMENT:

- A. Payment will be made at the unit price for each type of structure modified as indicated in the Bid Proposal and as tabulated in the field for completed work.

PART 4 TESTING

4.1 GENERAL

- A. Testing of materials supplied shall be at the discretion of the Engineer to ensure compliance.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section covers the work necessary to establish lawns by means of seeding or sod, planting of ground covers, fertilizing, weeding, placement of top soil - trees, shrubs and plants, maintenance of planted areas, irrigation systems and drain-ways complete.

PART 2 PRODUCTS

2.1 GRASS SEED:

- A. All seed products shall be handled in accordance with Oregon State laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act.
- B. Seed shall be from the latest crop available and further shall be tested blue tag stock.
- C. Containers shall bear a label showing the seed variety, percentage of purity, germination, maximum weed content, date of test (within nine months of the delivery date), as set forth in the General Seed Certification Standard by the Oregon State University Certification Board.
- D. Mold or evidence of container having been wet or otherwise damaged will be cause for rejection of each lot of seed.

2.2 GRASS SOD:

- A. Provide grass sod from certified or approved source, strongly rooted and free of pernicious weeds.

2.3 PLANTS:

- A. Provide plants which are nursery grown and are sound, healthy, vigorous, and free from insects, diseases, and equal to or exceeding measurements specified. Provide sizes and methods of handling according to the code of standards recommended by the AAN.
- B. Names specified and/or shown on the drawings conform to standardized names of the American Joint Committee on Horticultural Nomenclature. Names of varieties not included therein conform to names generally accepted in the nursery trade.

2.4 IMPORTED TOP SOIL:

- A. Where imported topsoil is specified in the Contract Documents, provide natural, fertile, friable topsoil, representative of local productive soil, and 90-percent free of clay lumps or other foreign matter larger than 2-inch diameter, not frozen or muddy, with 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^o C.
- B. Imported topsoil shall be free of quack grass, horsetail, and other noxious vegetation and seed.

Should such regenerative material be present in the soil all resultant growth, both surface and root, shall be removed by Contractor within one (1) year of acceptance of the work at no expense to the Owner.

2.5 SAND:

- A. Sand shall be inert material, washed and reasonably free of clay, loam, shale, alkali, vegetable matter, and other deleterious matter occurring either free or as coating particles.
- B. Do not mix sand from differing geological sources.

2.6 PEAT:

- A. Use a peat consisting of natural residue formed by decomposition of reeds, sedges, or mosses from freshwater site, free from lumps, roots, and stones, absorbing at least four times its dry weight of water, organic matter not less than 90-percent on a dry weight basis, and maximum moisture content at time of delivery of 65-percent by weight.

2.7 LIME:

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

2.8 UNDERDRAINS:

- A. Underdrains shall be of PVC slotted drainpipe, Schedule 80 and 4-inch diameter. Pipe shall have a minimum of 4 rows at 0.010-inch openings minimum and spaced at a maximum of 0.025-inch per opening. Aardvark, flush joint thread, conforming to ASTM F480 or equal will be acceptable.
- B. All fittings, bends and appurtances shall be of same manufacturer or approved as a substitute by the Manufacturer.

2.9 IRRIGATION SYSTEMS:

A. PIPE.

- 1. Use PVC pipe (SDR-PR), conform to ASTM D2241, and use fittings of PVC with deep socket dimensions conforming to ASTM D2466.
- 2. When using copper pipe, Type K soft copper, conforming to ASTM B88, 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.

B. GATE VALVES.

1. Install the following gate valves: to and including 3-inch with bronze bodies, 4-inch and larger with either bronze or iron bodies, all with bronze, all with bronze stems, bronze seat rings, and bronze disc faces, conforming to ASTM B62.

C. PRESSURE REDUCING VALVES.

1. Use adjustable, heavy duty bronze, with 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.

D. CONTROL VALVES.

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

E. QUICK-COUPLING VALVES.

1. Supply one-piece body type, locking cap, 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.

F. RISERS.

1. 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.

G. VACUUM BREAKERS.

1. 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 as an assembly consisting of vacuum breaker, two gate valves, check valve union, and nipples, as approved.

H. BACKFLOW PREVENTERS.

1. Use either reduced pressure or double check valve assemblies, as shown, of a type and size approved by the Engineer and in compliance with State and local Plumbing Codes.

2.10 FERTILIZER:

- A. Fertilizer shall be non-chemical, organic type.

- B. Contractor shall submit his proposal for organic fertilizer to the Engineer for approval at or before the Pre-Construction Conference.

2.11 TIE-DOWNS:

- A. Use one or more of the following as needed:
 - 1. Wood stakes, 2-inch by 2-inch by height as needed, clear straight cedar, or approved equal.
 - 2. Wire for guys, or for fastening trees to stakes, of 12-gauge, pliable galvanized steel.
 - 3. Hose for guy wire encasement, of 2-ply reinforced rubber garden hose, minimum 1/2-inch diameter new or used.
 - 4. Turnbuckles, zinc-coated, with a 6¹/₂-inch lengthwise opening, 3/8-inch diameter threaded openings fitted with screw eyes.
 - 5. Wrapping material of first quality, burlap, minimum 8-ounce weight, 6-inches to 10-inches in width.
 - 6. Eye-bolt masonry anchors of galvanized steel, with galvanized shield of slush shield for setting into masonry joint or concrete.

PART 3 EXECUTION

3.1 GENERAL:

- A. Conform to manufacturer's and supplier's recommendations and instructions and to accepted industry standards.

3.2 DELIVERY, HANDLING, AND STORAGE:

- A. 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 areas of site designated.
- B. If sod is not laid within two days of delivery, spread out flat with grass side up in a cool place and kept moist. Rolled or stacked sod that becomes yellow will not be accepted.

3.3 SOIL TEST

- A. If it is deemed necessary, by the Engineer, a soil test will be made on a sample of the native material by a certified laboratory for chemical analysis and recommendations for soil improvement.
- B. If required, the soil test will be done at no expense to the Contractor.

3.4 PREPARATION OF SUBGRADE:

- A. After rough grading is completed and before topsoil is spread, apply lime and/or super phosphate as determined by soil analysis.

3.5 UNDERDRAINS:

- A. Underdrains shall be sloped at 1/4-inch per foot, unless otherwise shown on plans.
- B. Underdrains shall be enveloped in filter fabric and drain rock as specified in SECTION 2200 of these specifications.

3.6 SEEDING:

- A. 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 a rate of one pound per 300 square feet, roll with cultipacker to cover seed, and water with fine spray. Method of seeding may be varied, as approved, however, responsibility to establish a smooth, uniformly grassed area will not be waived.

3.7 SOD:

- A. Before sod is laid, correct soft spots and irregularities in grade of prepared bed, as approved. Lay so that no voids occur and tamp or roll, brush or rake screened topsoil with no lumps or stones larger than 3/4-inch over sodden area. Water sod thoroughly. Complete sod surface true to finish grade even and firm. On slopes steeper than 1:2, fasten sod with wooden pins 6-inches long driven through sod into soil flush with top of sod at approved intervals.

3.8 TREES, SHRUBS, AND GROUND COVER:**A. DELIVERY, PREPARATION, AND STORAGE.**

1. Dig plants with firm, natural balls of earth of diameter and in depth sufficient to encompass the fibrous and feeding root system required for full recovery of plant. Firmly wrap balls with burlap and bind with twine, cord, or wire mesh. Where necessary, to prevent breaking or cracking of ball during process of planting, or where the tree exceeds 4-inches in diameter, secure ball to a platform.
2. Dig bare root plants to remove earth with the least possible injury to fibrous root system. Cover roots with thick coating of mud by submerging or wrapping in wet straw, moss, or other suitable packing material immediately after digging for protection until delivery.
3. Furnish container grown plants with self-established root systems sufficient to hold earth together after removal from container but not root-bound, grown for at least three months in container.
4. 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.

5. 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.
6. Open and separate all bundles of heeled-in bare root plants before the roots are covered. Avoid leaving air pockets among roots.

B. SOIL CONDITIONING.

1. If soil test is required by the Engineer and indicates soil conditioning is required, Contractor shall thoroughly mix topsoil with conditioning agent as directed by soil report and manufacturer's directions.

C. PLANTING PROCEDURE.

1. Locate new planting where shown, except make approved adjustments where obstructions below ground are encountered or where changes have been made in the construction. Place no planting, except ground cover, closer than 18-inches to pavements and structures. Dig plant pits and have soil mixture for planting ready before plants are delivered. Excavate circular pits with vertical sides a minimum of 1-foot greater than the diameter of the ball. For trees, shrubs, and vines excavate pits to depth sufficient to accommodate ball or roots when plant is set to finished grade. Place 3-inches of compacted soil mixture in the bottom of pit. Set plants upright and face as approved to give the best appearance or relationship to adjacent structures. Do not pull burlap from under balls. Remove wire and surplus binding from top and sides of balls. Spread roots in normal position. Cut all broken or frayed roots off cleanly. Place prepared soil mixture and compact carefully to avoid injury to roots and to fill voids. When hole is nearly filled, add water as necessary and allow it to soak in. Fill hole to finished grade and form shallow saucer around plant by placing ridge of topsoil around edge of pit 2-feet greater than diameter of ball. After ground settles, fill with additional soil to level of finished grade.
2. Plant trees before surrounding smaller plants and covers are placed. Position trees as shown or, where spacing dimensions or locations are not clear, as approved
3. Plant shrubs on centers as shown, with spacing adjusted if required to evenly fill bed using specified quantity of plants.
4. Plant hedges on centers as shown. Excavate trenches a minimum of 4-inches deeper and 12-inches wider than spread of roots or diameter of balls. Make adjustments to spacing if necessary to fill trench evenly with the quantity of plants shown.
5. Plant ground covers in beds having minimum 8-inches of prepared soil mixture. Treat

ground cover beds after preparation for planting, but before any plants are installed within bed area, with soil sterilant to destroy weed seeds. Apply according to manufacturer's directions delaying planting for the recommended minimum period to allow dissipation of herbicide. Space plants as shown. Mulch and water immediately after planting.

6. Plant bulbs in ground cover beds to recommended depths for each bulb type as shown.
7. Provide trees and planting beds with 2-inch layer of organic within two days after planting and keep at this depth throughout maintenance period. Cover beds with stone mulch where shown to a depth of 4-inches. Mulch to entirely cover area of saucer around each tree.

D. DRAINAGE OF PITS AND BEDS.

1. Furnish subsoil drainage where shown. Dig trenches with vertical sides and smooth bottoms a minimum of 12-inches wide and 6-inches below tree balls, or 18-inches below finished grade at highest end of drain.
2. Lay filter fabric snugly in trench against native excavation and the place drain rock bedding material to grade. Bed drainpipe firmly, lay true to grade with minimum slope of 0.0208-feet-per-foot (1/4-inch per foot) and connect to approved outlet or discharge at grade.
3. Backfill trench with drain rock to a minimum of 4-inches above the top of drain pip, or as shown on plans, then overlay filter fabric on top.
4. Complete backfilling with approved native material and topsoil to finish grade as shown on plans.

E. PRUNING AND REPAIR.

1. At completion of planting work, prune and repair injuries to all plants. Limit amount of pruning to minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of planting operations. Do not change natural habit or shape of plant. Make cuts flush, leaving no stubs. On all cuts over 3/4-inch in diameter and bruises or scars on bark, trace the injured cambium back to living tissue and remove. Smooth and shape wounds so as not to retain water. Coat with approved tree wound paint.

3.9 IRRIGATION SYSTEMS

A. GENERAL.

1. Install components of the irrigation system as shown and as recommended by the equipment manufacturers. All sprinkler run outs shall be evenly graded to the drain points shown. Piping beneath paved areas shall have a minimum cover of 30-inches.

B. PVC PIPE.

1. Cut, make up, and install PVC pipe, sprinkler heads and valves in accordance with the manufacturer's recommendations, as approved.
2. Bed PVC pipe in sand, as shown and backfill to a minimum of 2-inches above the pipe with sand.
3. Flush out system thoroughly before installing sprinkler heads. Adjust flow on each head for proper coverage.
4. Do not lay pipe when ambient temperature is less than 40 degrees F.

3.10 MEASUREMENT AND PAYMENT:

- A. All landscaping work and products shall be paid for at the unit price established in the Bid for work completed and field verified and/or measured.

PART 4 TESTING**4.1 GENERAL:**

- A. **IRRIGATION SYSTEM** - When irrigation system is installed, complete, a line test of the working pressure will be performed in accordance with SECTION 5000 of these specifications.
- B. All other products shall be tested at the discretion of the Engineer for conformance with these specifications and in accordance with standard testing and lab practices.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section covers the work necessary to furnish and install concrete modular retaining wall units with fiberglass shear/alignment pins to the lines and grades shown on the construction plans, within reasonable field tolerance, and as specified herein.
- B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit fill and backfill to the lines and grades shown on the plans.
- C. Work includes furnishing and installing geogrid reinforcement and backfill to the lines and grades shown on the plans.

1.2 REFERENCE SPECIFICATIONS:

- A. Technical Specification Section 2000 – Cast In-Place Concrete
- B. Technical Specification Section 3100 – Earthwork
- C. ASTM C 1372 – Standard Specification for Segmental Retaining Wall Units; Current Ed.
- D. NCMA SRWU-1 – Test Method for Determining Connection Strength of SRW; National Concrete Masonry Association.
- E. Manufacturer’s Specifications and Recommendations Manual.

1.3 DEFINITIONS:

- A. **MODULAR UNIT:** A concrete retaining wall element machine made from Portland Cement, water and aggregates.
- B. **REINFORCED BACKFILL:** A compacted soil, which is placed within the reinforced soil volume as outlined on the Plans.
- C. **UNIT FILL:** A drainage aggregate, which is placed within and immediately behind the modular concrete units.
- D. **STRUCTURAL GEOGRID:** A structural element formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock or earth and to function primarily as reinforcement.
- E. **SHEAR/ALIGNMENT PIN:** A pultruded high strength isophthalic polyester resin glass reinforced pin, which fits the manufactured holes in the concrete units and interconnects units and courses.

PART 2 PRODUCTS

2.1 MANUFACTURER:

- A. Provide modular concrete retaining wall units and accessory materials as fabricated by authorized manufacturers of Keystone Retaining Wall Systems, Inc. 4444 West 78th St. Minneapolis, MN 55435. Tel. 952.897.1040, or equal.

2.2 MATERIALS:

- A. Modular concrete retaining wall units shall comply with ASTM C 1372 and the following;
- B. COLOR: Manufacturer's standard color palette.
- C. FACE FINISH: Sculptured rock face in angular tri-planar configuration for Standard and Compac units. Weathered straight face for Keystone Century Wall and Country Manor Units, or approved equal.
- D. BOND CONFIGURATION: Running, with bonds nominally located at midpoint vertically adjacent units, in both straight and curved elements.
- E. Exposed face shall be free of chips, cracks or other imperfections when viewed from a distance of 5-feet, in daylight.
- F. COMPRESSIVE STRENGTH: Shall be 3,000-PSI minimum.
- G. ALIGNMENT AND GRID POSITIONING MECHANISM: Fiberglass pins, min. of two per unit unless using smaller units that only have provision for one pin.
- H. SETBACK: Provide installed vertical setback of 1/8 inch plus or minus per course, unless specified otherwise on the Plans.
- I. KEYSTONE STANDARD UNITS: Width 18-inches, Depth 18-24 inches, Height 8-inches, Weight 100 lbs., Inter-Unit Shear Strength 1,500 lbs per linear foot, min. at 2 PSI normal pressure, Geogrid/Unit Peak Connection Strength 1,000 lbs per linear foot, min., at 2 PSI normal force.
- J. KEYSTONE COMPAC UNITS: Width 18-inches, Depth 12-inches min., Height 8-inches, Weight 75 lbs., Inter-unit shear strength 600 lbs per linear foot, min. at 2 PSI normal pressure, Geogrid/Unit Peak Connection Strength 500 lbs per linear foot, min., at 2 PSI normal force.
- K. KEYSTON CENTURY AND COUNTRY MANOR UNITS: Use and approval on a case-by-case basis. Units shall conform to Keystone, or approved equal, dimensions and specifications.
- L. ACCESSORY UNITS: Provide matching units. CORNER UNITS; Provide 90 degree corners finished two sides, where indicated. CAP UNITS; Provide solid cap units with parallel sides for straight walls and convex walls, angular sides for concave walls. Caps may be solid or have 1/2-inch depth voids for connection to alignment/shear pins from course below.

- M. **SHEAR CONNECTORS:** Non-shouldered pins; ½-inch diameter x 5.25-inches long thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods. Shoulder Pins; Same as Non-shoulder pins except as follows; ¾-inch diameter, Flexural Strength 128,000 PSI, min., Short Beam Shear 6,400 PSI, min., Provide products that are capable of maintaining strength over design temp. range of minus 10 deg. F to plus 100 deg. F. Provide products that are capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling. All pins provided shall be by “approved vendor” with verification notice issued by the Manufacturer.
- N. **CONSTRUCTION ADHESIVE:** Use Keystone KapSeal, or approved equal, as supplied by Manufacturer of modular retaining wall systems.
- O. **BASE LEVELING PAD MATERIAL:** Compacted crushed gravel or non-reinforced concrete as shown on drawings.
- P. **UNIT DRAINAGE FILL:** Clean 1-inch minus crushed gravel meeting the following gradation; Pea gravel is not acceptable.

GRADATION	PCT. PASSING SIEVE
1"	100
¾"	75-100
No. 4	0-10
No. 50	0-5

- Q. **REINFORCED BACKFILL:** Free of debris and meeting the following gradation;

GRADATION	PCT. PASSING SIEVE
2"	75-100
¾"	75-100
No. 4	20-100
No. 40	0-60
No. 200	0-35
Plastic Index (PI)	Less than 10
Liquid Limit (LL)	Less than 40

- R. **GEOGRID:** High tenacity polyester yarn or high-density polyethylene specifically fabricated for use as soil reinforcement.

PART 3 EXECUTION

3.1 GENERAL:

- A. Conform to manufacturers and supplier's recommendations and instructions and to accepted industry standards.
- B. Verify the layout dimensions are correct and substrate is in proper condition for installation. Do not commence installation until unsatisfactory conditions have been addressed and rectified.

3.2 DELIVERY, HANDLING, AND STORAGE:

- A. Check materials upon delivery to assure that proper materials have been received and in excellent, new condition.
- B. Prevent excessive mud, wet cement, epoxy and similar materials (which affix themselves) from coming in contact with the materials.
- C. Protect delivered units from damage; do not use damaged materials.

3.3 EXCAVATION:

- A. Excavate to the lines and grades shown on the plans. Obtain the Engineer's approval of line and grade prior to placement of leveling material. Proof roll foundation area to determine if remedial work is required.
- B. Over excavation of deleterious soils and replacement with suitable fill, when approved in advance by the Engineer will be paid by Change Order work.
- C. Do not disturb embankment and foundation materials beyond lines shown.

3.4 BASE LEVELING PAD:

- A. Place leveling pad material to the lines and grade shown on the Plans. Extend leveling pad a minimum of 6-inches beyond the front and back faces of units and min. of 6-inches thick.
- B. Compact granular leveling pad material to a minimum of 90 pct. of modified proctor T-180, unless indicated otherwise on the Plans.
- C. Prepare leveling pad to ensure full contact to the base surface of the concrete units.

3.5 MODULAR UNIT INSTALLATION:

- A. Place first course of units on leveling pad and check alignment and level. Use pins or molded surface of modular concrete units to alignment control; do not attempt alignment from rock face split surface, due to its irregular split finish.
- B. Ensure that all units are in full contact with the base and properly seated.
- C. Place fronts of units side-by-side. Do not leave gaps between units. Lay out corners and curves in accordance with the manufacturer's recommendations.
- D. Install shear connectors. Verify specified setback position as indicated on drawings.
- E. Place and compact drainage fill within and behind units. Place minimum of 1 CF per unit of drainage fill within the cores of the units, between units and behind units.
- F. Place and compact backfill soil behind drainage fill.

- G. Follow wall and drainage fill installation closely with backfill. Maximum stacked vertical height of wall units prior to drainage fill and backfill placement and compaction not to exceed 2 courses.

3.6 STRUCTURAL GEOGRID INSTALLATION:

- A. Orient geogrid with the highest strength axis perpendicular to the wall alignment.
- B. Place geogrid reinforcement at the elevations and to the extent shown on the construction drawings or as directed by the Engineer.
- C. Lay geogrid horizontally on compacted backfill and attach to the wall units. Place the next course of modular concrete units over geogrid. Pull geogrid taut and anchor prior to backfill placement on the geogrid.
- D. Install geogrid reinforcements continuous throughout embedment lengths and side-by-side for 100 pct. coverage at each level. Do not splice shorter pieces of geogrid or leave gaps between ends of pieces.

3.7 REINFORCEMENT BACKFILL PLACEMENT:

- A. Place, spread and compact backfill in such a manner that minimizes the development of slack in the geogrid and other damage.
- B. Place and compact reinforced backfill in lifts not to exceed 6-inches where hand compaction is used, or 8 to 10-inches where heavy compaction equipment is used. Decrease lift thickness where necessary and as directed by the Engineer to achieve required density.
- C. Compact reinforced backfill to 90% of T-180 proctor or 95% of ASTM D 698, unless indicated otherwise on the Plans.
- D. Contractor shall use only lightweight hand operated compacting equipment within 3-feet of the tail of the modular concrete unit.
- E. Do not operate tracked equipment directly on the geogrid. A minimum of 6-inches of fill thickness shall protect the geogrid from construction traffic.
- F. At the end of each day's installation, slope the last lift of reinforced backfill away from the wall units to direct runoff away from the wall face. Do not allow surface runoff from adjacent areas to enter the wall construction site.

3.8 CAP INSTALLATION:

- A. Glue cap units to underlying units with Manufacturer's all-weather adhesive, or approved equal.

3.9 FIELD TOLERANCES:

- A. Vertical Alignment; Plus/minus 1.5-inches over any 10-foot distance
- B. Wall Batter; Within 2 degrees of design batter.
- C. Horizontal Alignment; Plus/minus 1.5-inches over any 10-foot distance; corners, bends and curves plus/minus 1-foot to theoretical location.
- D. Maximum Horizontal Gap Between Erected Units; ½-inch.

PART 4 TESTING

4.1 GENERAL:

- A. The Owner will engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction at the discretion of the Engineer. This does not relieve the Contractor from securing the necessary construction control, quality assurance and testing of delivered materials and during construction.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This work consists of cleaning and removal of all refused and unused materials resulting from the work and preparing the project site for acceptance by the Owner.
- B. Reference General Conditions, Article E(16).

PART 2 PRODUCTS

2.1 GENERAL:

- A. The Contractor shall provide all equipment, tools, and materials necessary to accomplish the work.

PART 3 EXECUTION

3.1 SURFACE DRESSING:

- A. Slopes, sidewalk areas, planting areas, ditches, and streets shall be smoothed and dressed to the required cross section and grade elevation without damaging the work or existing improvements, trees and/or shrubs.
- B. Upon completion of the cleanup, the project shall appear uniform in all respects. Existing planting areas shall be graded to match the elevation of the new structures, with allowance made for settlement.

3.2 CLEANING DRAINS:

- A. Drainage facilities such as inlets, catch basins, culverts and open ditches shall be cleaned of all excess material or debris resulting from the work.

3.3 CLEANING PAVED SURFACES AND APPURTENANCES:

- A. Pavement surfaces, curbs, gutters, walls, sidewalks, manhole covers, monuments, poles, vaults, signs and other items within the limits of the project shall be cleaned as directed.

3.4 RESTORING PLANTED AREAS:

- A. Former grassed and planted areas shall be hand raked and dragged to be free from rocks, gravel, clay or any other foreign material, and ready in all respects for seeding.
- B. The final surface shall be free draining and free from holes, rough spots, or other surface features detrimental to a seeded or sodden area.

3.5 RESTORING STAGING, BORROW, AND DISPOSAL AREAS:

- A. Uprooted stumps, felled trees, rock, discarded materials, rubbish and debris shall be removed. Equipment, tools and supplies shall be removed and the areas restored to a neat and orderly

condition.

3.6 DISPOSAL OF WASTE MATERIAL:

- A. Excess excavated material or construction debris shall be removed and disposed of in an approved (Agency permitted) landfill. Where brush, tress and other vegetative matter has been disturbed, which are beyond the limits of the project site, the Contractor shall remove and restore as directed by the Engineer at no cost to the Owner.

3.7 REMOVAL OF TEMPORARY SIGNS:

- A. Warning, regulatory, guide or project signs shall not be removed prior to formal acceptance, except as directed.

3.8 REPLACEMENT OF PERMANENT SIGNS:

- A. Permanent roadway signing removed during the course of the work shall be replaced as directed by the Engineer.

3.9 MEASUREMENT AND PAYMENT:

- A. Payment will be based upon the unit price as stated in the Bid.
- B. If unstated as a Bid item then work is incidental to the Contract work.

PART 4 TESTING

4.1 GENERAL:

- A. Testing will be defined as a visual inspection or as determined appropriate by the Engineer for compliance to these specifications.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This item covers all work, equipment and tools necessary for construction of excavated trenches and backfill for buried pipe systems.

1.2 DEFINITIONS:

- A. **TRENCH EXCAVATION** - Trench excavation shall be unclassified excavation and shall include all materials that are encountered to the depths as shown on the Plans or as directed by the Engineer.
- B. **TRENCH FOUNDATION** - Trench foundation is defined as the material on the bottom of the trench on which the pipe bedding is to lay and is responsible for the support of the pipeline.
- C. **TRENCH FOUNDATION STABILIZATION** - Trench foundation stabilization is the zone of material, engineered fill, which makes up the trench foundation when liquefaction caused by high pore water pressure occurs in the trench.
- D. **PIPE BEDDING** - Pipe bedding is defined as the furnishing and placing of specified materials on the trench foundation so as to uniformly support the barrel of the pipe. The total bedding depth shall be a minimum of 4-inches unless otherwise specified.
- E. **PIPE ZONE** - Pipe zone is defined as the full width of the trench, and from the top of the bedding to a point 4-inches above the outside zenith of the pipe. Pipes larger than 12-inches may require more than 4-inches and as such will be detailed on Plans.
- F. **TRENCH BACKFILL** - Trench backfill is defined as the furnishing, placing and compaction of material in the trench between the top of the pipe zone material and the bottom of the pavement base rock, ground surface, or surface material as directed.
- G. **SURFACE REMOVAL AND REPLACEMENT** - Surface removal and replacement is defined as the removal and/or replacement of surface material such as topsoil, sod, sidewalks, gravel, etc. which requires special consideration in order to accomplish and restore the trench excavation area as specified.
- H. **GEOTEXTILE FABRIC** - Geotextile fabric is defined as a woven or non-woven fabric manufactured specifically for use in civil engineering applications. Fibers used in the manufacture of geotextiles consist of long chain synthetic polymers. At least 85 percent by weight of the long chain polymers are polyolephins, polyesters, or polyamides.
- I. **AC TRENCH (CAP) REMOVAL & REPLACEMENT** - is defined as asphaltic cement which must be saw-cut, removed, and replaced within right-of-way on road and street surfaces.

PART 2 PRODUCTS**2.1 TRENCH FOUNDATION STABILIZATION:**

- A. The trench foundation shall be native material in all areas except where ground water or other conditions exist, and in the opinion of the engineer, the native material is such that it cannot support the pipe.
- B. In those conditions, excavation shall be included to additional depths as required and backfilled with crushed rock ranging in size from 2¹/₂-inches to 1-inch minus, or pipe bedding material as directed.
- C. If in the opinion of the engineer it is necessary the over excavation shall be lined with a geotextile fabric which conforms to these Specifications.

2.2 PIPE TRENCH BEDDING AND ZONE:

- A. Pipe trench bedding and zone material shall be placed as shown on the plans and in accordance with (Type A, B, C, or D as shown on) Standard Detail No.3800-2, and shall consist of one of the following;
 - 1. TYPE A - Bare earth.
 - 2. TYPE B, C, and D -Shall be 1-inch minus crushed aggregate conforming to Section 2300.
 - 3. See Standard Detail 3800-2.

2.3 PIPE TRENCH BACKFILL

- A. Trench backfill, as specified on the Plans, shall consist of one of the following;
 - 1. CLASS 1 BACKFILL - Class 1 backfill shall be native or common material, free of deleterious material as approved by the engineer which, in the opinion of the engineer, meets the desired characteristic required for the specific surface loading or other criteria of the backfill zone.
 - 2. CLASS 2 BACKFILL - Class 2 backfill shall the same type and nature as Class 1, above.
 - 3. CLASS 3 BACKFILL - Class 3 backfill shall be imported granular material consisting of gravel or crushed rock, free of deleterious material as approved by the engineer, meeting the requirements of Section 2300. Designated size shall be 1-inch minus, unless otherwise specified.
 - 4. CLASS 4 BACKFILL - Class 4 backfill shall be controlled density fill (CDF), a mixture of portland cement, fly ash, aggregates, water and admixtures proportioned to provide a non-segregating free flowing and excavatable material which will result in a hardened,

dense, non-setting fill. This mixture shall be batched and mixed in accordance with ASTM C 94 and shall further conform to the following:

Portland Cement:	ASTM C 150, Type I or II.
Fly Ash:	Class F or Class C, ASTM C 618.
Aggregates:	ASTM C 33.
Water:	Potable.
Admixtures:	AASHTO M 194 or ASTM C 260.

- B. See Standard Detail 3800-1.

2.4 TOPSOIL:

- A. Topsoil shall be fertile, loamy, natural surface soil consisting of sands, clays and organic matter in combination and free from substances toxic to plant growth, noxious weeds, roots, refuse, sticks and lumps.

2.5 GEOTEXTILE FABRIC:

- A. Fabric shall be woven geotextile fabric and as specified in SECTION 2200, "Geotextiles and Fabrics", of these Specifications.

2.6 AC TRENCH CAP:

- A. Existing asphaltic cement material overlying trench excavation shall be replaced with Type "C" bituminous hot-mix as specified in Section 2400 after trench has been satisfactorily backfilled and compacted.
- B. See Standard Detail 3800-5.

PART 3 EXECUTION

3.1 CLEARING THE RIGHT-OF-WAY:

- A. Where clearing of the right-of-way is necessary, it shall be completed prior to the start of the trenching. Trees and brush shall be cut as near to the surface of the ground as feasible and piled for disposal. Disposal by burning shall conform to DEQ requirements, unless otherwise directed by the engineer. The contractor shall observe all Federal and State laws relating to fire permits and local regulations relating to burning such materials. Daily burning info may be obtained by calling 503.982.0011.
- B. Existing trees or tree limbs whether on public or private property, are not to be removed without permission from the engineer.

- C. Contractor shall call for locates of all underground utilities prior to excavation beginning. A spotter shall be utilized during all excavations to ensure protection of marked and potentially unmarked utilities. Reference Article H.3 of the General Conditions.
- D. Contractor shall adhere to Article H.4 of the General Conditions in regards to protecting the environment and public from construction pollutants.
- E. All excavations within the right-of-way shall be covered at the end of each workday to protect persons and property.

3.2 OBSTRUCTIONS:

- A. This item refers to obstructions which may be removed and do not require replacement. Obstructions to the construction of the trench such as but not limited to stumps, abandoned piling, abandoned structures, logs, rubbish, and debris of all types shall be removed by the contractor at his own expense without additional compensation from the owner.
- B. The engineer will, if requested by the contractor, make changes in alignment to avoid major obstructions if such alignment changes can be made without adversely affecting the intended functioning of the facility.
- C. Refer to Article E.8 of the General Conditions for other obstructions.

3.3 AC TRENCH CAP:

- A. All bituminous and concrete pavements, regardless of the thickness, shall be saw cut, to a vertical face, prior to excavation of trenches with a concrete saw. Width of the pavement cut shall be at least six (6) inches greater than the required width of the trench at ground surface on each side. Pavement removed during excavation shall be piled separately from the earth spoil and removed from the site, to a "Permitted" landfill, or recycle plant, and shall not be used in backfilling the trench.
- B. Bituminous asphalt mix shall be handled, mixed, placed, and compacted as specified in Section 2400.
- C. Trench surface (backfill surface) shall be leveled and compacted by means of a vibratory compactor to a depth of 2.5-inches (Min., or to existing thickness) below the existing finished grade. Backfill shall be compacted as specified on the Plans.

3.4 TRENCH WIDTH

- A. Width of trenches in which pipe is to be laid shall be twenty-four-inches (24") greater than the outside diameter of the pipe (1-ft. each side of the O.D.), except by permission of the engineer; and

- B. Trench width shall not extend outside dedicated rights-of-way for public thoroughfares or beyond the limits of the construction easement.

3.5 LINE AND GRADE:

- A. The bottom of the trench shall be carried to the lines and grades shown on the Plans or as established by the Engineer, with proper allowance for pipe thickness and for gravel cushion or special bedding when required. Any part of the trench over-excavated below grade shall be corrected with material of the type approved by the engineer, for the full width of the trench and thoroughly compacted layers not to exceed 8-inches, to the established grade and at the Contractor's expense.

3.6 DEWATERING:

- A. Dewatering shall conform to the requirements as outlined in Article H.6 of the General Conditions of the City of Woodburn, OR.

3.7 SHORING:

- A. Shoring, sheeting and bracing of trenches and pits shall conform to Article H.5 of the General Conditions of the City of Woodburn, OR.

3.8 LOCATION OF THE EXCAVATED MATERIALS:

- A. During trench excavation, the contractor shall locate the excavated material so it will not obstruct a traveled roadway or street. Unless otherwise approved by the engineer, all streets and roadways shall be kept open to at least one-way traffic.
- B. If excavated material is to be reused it shall be kept free from debris and covered by tarp(s), if necessary, to prevent excessive drying and/or saturation.

3.9 FOUNDATION STABILIZATION:

- A. In the event that unforeseen native material at the trench foundation is unsuitable for structural support of the pipe, the contractor shall notify the engineer immediately.
- B. When, in the opinion of the engineer, the material in the bottom of the trench is unsuitable for supporting the pipe, the contractor shall excavate from below the flow line, and to a depth, as directed by the engineer. Contractor shall place geotextile fabric in the trench bottom and backfill with material the Engineer deems necessary to comply with these specifications.

3.10 PIPE TRENCH, BEDDING AND ZONE:

- A. TYPE A - Cut trench to native material at grade and place pipe barrel on grade. Remove material to allow for flange and/or bell to rest below grade line. If bed is cut too deep and native material must be replaced it shall be compacted to a firm state as approved by the engineer.

- B. TYPE B - Cut trench to native material to depth indicated on Plans. Place crushed aggregate to pipe grade and compact to 95-percent of AASHTO T-99. Place pipe. Remove material at bells of pipe. Ensure no annular space is left and barrel is fully supported.
- C. TYPE C - Cut trench to native material to depth indicated on Plans. Place crushed aggregate to pipe grade and compact to 95-percent of AASHTO T-99. Place pipe. Remove material at bells of pipe. Chink or tamp in final lift of aggregate to spring line of pipe. Ensure no annular space is left and barrel is fully supported.
- D. TYPE D - Cut trench to native material to depth indicated on Plans. Place crushed aggregate to pipe grade and compact to 95-percent of AASHTO T-99. Place pipe. Remove material at bells of pipe. Chink or tamp in final lift of aggregate to top of pipe zone. Ensure no annular space is left and barrel is fully supported.

3.11 TRENCH BACKFILL:

- A. CLASS 1 BACKFILL - The trench shall be backfilled with loose native or approved equal. The fill shall be brought to the surface with a 2-inch minimum crown to allow for future settlement.
- B. CLASS 2 BACKFILL - The trench shall be backfilled with native material or approved equal, compacted, in 8-inch maximum lifts, by mechanical means and brought to surface with a 2-inch min. crown for future settlement.
- C. CLASS 3 BACKFILL - The trench above the pipe zone shall be backfilled with clean, well-graded, coarse to fine, 1-inch minus crushed rock compacted in 8-inch lifts in conformance to 95-percent of AASHTO T-180.
- D. CLASS 4 BACKFILL - Controlled density backfill shall be placed at a rate that allows handling of material to ensure that no voids are created. Material shall be vibrated or rodded into place.

3.12 DISPOSAL OF EXCAVATED MATERIAL:

- A. Excavated material in excess of that needed to complete the work shall be disposed of at no expense to the Owner.
- B. All waste material shall be deposited in an approved and/or "Permitted" landfill as defined herein.

3.13 PRESERVATION OF EXISTING IMPROVEMENTS:

- A. The Contractor shall conduct operations in a manner that will protect any and all existing facilities in accordance with Article E(8) of the General Conditions and as directed by the Engineer.

3.14 EXCAVATION OF EXISTING FACILITIES:

- A. The Contractor shall remove remaining ends of abandoned pipes or portions of other items partially removed under this work, which would be left, exposed on side slopes or at subgrade, to a minimum of 1-foot beyond or below the finished slope or subgrade. Abandoned pipes shall be capped or plugged watertight.

3.15 MEASUREMENT AND PAYMENT:

- A. Payment will be on the field measured quantities as outlined in the Bid and as broken down to Type of bedding and class of backfill differentiated by the following depths;

- 0 - 6 feet
- 6 - 10 feet
- 10 - 14 feet
- 14 - 18 feet
- 18 - 22 feet
- Over 22 feet

PART 4 TESTING**4.1 GENERAL**

- A. At the direction of the engineer a sample of material(s) shall be taken and tested by a qualified/certified testing laboratory for specified properties
- B. At the direction of the engineer any and all backfill, pipe bedding & zone material, and foundation stabilization material shall be tested for in-place quality and specified tolerances.
- C. HMA trench cap material shall be tested by a certified lab and in accordance with Section 2400.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section identifies requirements for erosion prevention and sediment control. The emphasis of this Section is to prevent and reduce adverse impacts to the drainage system in the City Of Woodburn, OR.
- B. The Contractor shall inform himself of any and all state, county or federal regulations in this matter and ensure he is in compliance.

1.2 EXISTING VEGETATION:

- A. The Contractor shall as far as is practicable, protect and leave in place the existing vegetation. Strict adherence to the limits of the approved Erosion Prevention Control Plan and as flagged in the field is required.
- B. Where existing vegetation has been removed, new vegetation shall be established as soon as is practicable.

PART 2 MATERIALS

2.1 CHECK DAMS:

- A. SAND BAGS may be used for check dams when constructed of clean, washed sand and placed in bags, which will contain 100-percent of the fill sand. Bags shall be 24 x 12 x 6-inch and made of weather resistant tightly woven Geotextile fabric. Filled bags shall not weigh less than 75-lbs each.
- B. ROCK – Shall be well-graded gravel or crushed rock, 2-inch max. diameter and less than 5-percent fines reasonably free of all organic material. Rock shall be graded so as to allow for maximum permeability while slowing water to allow for particle settlement.
- C. PREFABRICATED SYSTEM – A manufactured system specifically designed to, settle out suspended particles, slow water and is approved by the Engineer. Field fabricated systems are not allowed.
- D. BIO-FILTER BAGS – Bio-filter bags shall be clean 100-percent recycled wood product waste. Standard size 10 x 8 x 30-inches, weight approximately 45-lbs, with ½-inch plastic netting. Provide (2)-1 x 2-inch fir or pine stakes per bag.

2.2 SEDIMENT FENCE:

- A. FABRIC FENCE - Standard or heavy-duty sediment fence, woven filter fabric having a manufactured stitch, only, shall be allowed. Woven filter fabric shall meet the requirements for, Type 2, Drainage Geotextile in Section 2200 (2.4)(Table A-1).
- B. FENCE POSTS - Barrier post shall be (2 x 2)-inches x 4-foot fir, pine or steel fence posts.

2.3 TEMPORARY/PERMENANT SEEDING:

- A. Contractor shall supply a standard grass and/or legume seed mix for erosion control purpose specific to this type of application and region, as follows, or equal.
1. Dwarf Grass Mix:
Dwarf Perennial Ryegrass, 80% by wt.
Creeping Red Fescue, 20% by wt.
Application rate: 100 lbs min. per acre
 2. Standard Height Grass Mix:
Annual Ryegrass, 40% by wt.
Turf-type Fescue, 60% by wt.
Application rate: 100 lbs min. per acre
- B. Seed supplied shall be by Pure Live Seed (PLS) weight and certified as outlined in the OSU Extension Certified Seed Handbook (latest revision). Certification ticket or bag label shall have the following information on it to be accepted at the site.
1. Origin
 2. Kind and varieties of 3% or more by weight.
 3. Percent of germination.
 4. Percent of pure seed – free of dirt, dust, chaff, straw, empty kernels, weeds, other crops and/or etc.
 5. Percent of other crop – seed other than as labeled.
 6. Percent inert matter – by wt.
 7. Percent weed seed – legally defined weed seed, by wt.
 8. Percent noxious weed seed – legally defined noxious by wt.
 9. Percent hard seed – percent not germinated by end of test period.
 10. Test date – month/year.
 11. Name and address of labeler.
 12. Name and number per pound of restricted noxious weed seeds present.
 13. Lot weight.
- C. Lots showing Oregon prohibited weeds are not approved.

PART 3 EXECUTION**3.1 GENERAL:**

- A. Inspect all erosion control measures once weekly on active sites, bi-weekly on inactive sites, and immediately following a rain event with rainfall greater then 0.5-inches.

3.2 CHECK DAMS:

- A. Construct check dams in accordance with the Plans and details provided herein.
- B. Overlap check dams on the downstream side of flow.

- C. Never allow sediment to accumulate more than 1/3 of the check dam height.
- D. Sand bags shall NOT be staked.
- E. Replace/repair damaged check dams as soon as damage is observed.

3.3 SEDIMENT FENCE:

- A. Shall be installed 3-feet minimum, measured horizontally, from the toe of slope.
- B. Place support posts a maximum of 6-feet apart and drive at least 12-inches, into the ground.
- C. Sediment shall not accumulate more than 1.5-feet behind fence.
- D. Bury fabric 6-inches below grade in a trench along support post line.

3.4 TEMPORARY/PERMANENT SEEDING:

- A. Seeding shall be placed prior to September 1.
- B. Apply seed immediately after seedbed preparation has been completed.
- C. Roughen soil by harrowing, tracking, grooving or furrowing.
- D. Seedbed shall be firm but not compacted and the top 6-inches shall be loose, moist and free of large clods and stones.
- E. Harrowing, tracking or furrowing shall be done parallel to contours across the face of the slope.
- F. Apply seed using calibrated seed spreaders to ensure uniform and specified rate.
- G. When seed and mulch are applied concurrently, double the application rate of the seed.
- H. Apply mulch to slopes of 3:1 or flatter when soils are highly erodible or grass growth is expected to be slow.

3.5 SURFACE ROUGHING:

- A. All slopes 3:1 or flatter shall be roughened by mechanical means.
- B. Track cleats/grousers shall be 1.5-inches in height or greater.
- C. Tracking shall be accomplished by driving equipment up and down the slope to create horizontal depressions or grooves.

3.6 HYDROSEEDING:

- A. Seed, fertilizer, mulch, tackifier, soil amendments, bond fiber matrix, and chemical stabilization can be applied in a one step procedure.

- B. Apply wood or cellulose fiber mulch, dyed green, without growth inhibiting factors, at a rate of 2,000 lbs/acre with a hydromulcher.
- C. Apply Bonded Fiber Matrix (BFM) on slopes up to 1:1 at a rate of 3,000 to 4,000 lbs/acre, depending upon soil type and irregularities.
- D. Re-tack and re-seed areas damaged by runoff or other detrimental attack.

3.7 DEWATERING:

- A. Dewatering shall conform to Article H.6 as outlined in the General Conditions of the City of Woodburn, OR.

3.8 GROUND COVER (MULCH):

- A. Apply mulch to newly seeded areas.
- B. Divert any concentrations of runoff from mulched areas.
- C. Mulch shall be applied at normal BMP rates and conditions for the soil type, terrain and seed used for this region and as defined by DEQ.

3.9 MEASUREMENT AND PAYMENT:

- A. Erosion control measures shall be paid for at the unit price as outlined in the proposal and for the work accomplished and measured in the field.
- B. Silt fence, hydro-seeding, seeding, and/or mulching may be separate bid items and shall be paid for at the unit price as outlined in the proposal for the work accomplished and measured to the nearest 0.1 units in the field.

3.13 SUBMITTALS:

- A. Submit the following along with submittals required in appendix "A";
 1. Manufacturer's data for grass seed.
 2. Manufacturer's data for Hydro-seed
 3. Manufacturer's data for mulch.
 4. Manufacturer's data for sediment fence materials.
 5. Manufacturer's data for check dam materials.
 6. Dewatering Plan with copy of permit issued by permitting agency.

PART 4 TESTING

4.1 GENERAL:

- A. The Engineer shall have access to any material for independent testing for conformance to these Specifications and DEQ BMPs.

- B. Contractor shall supply to the Engineer all test conformance data available from the manufacturer upon request.

END OF SECTION

DIVISION 4 – STREETS

<u>SECTION</u>	<u>DESCRIPTION</u>
SEC 4100	Curbs and Gutters
SEC 4150	Sidewalks, Driveway Approaches and ADA Ramps
SEC. 4200	HMA Pavement
SEC. 4300	Signing and Pavement Marking

PART 1 GENERAL

1.1 SCOPE:

- A. This Section covers work necessary for the construction of curbs, gutters, and combination curb and gutter.
- B. See Standard Detail Nos. 4100-1, 4100-2, 4100-4 and 4100-5.

PART 2 PRODUCTS

2.1 GRADING AGGREGATES:

- A. Aggregate for grading shall be 1-inch minus as specified in Section 2300 of these Specifications.
- B. Aggregate materials for base, foundation courses, leveling courses, and/or bedding shall conform to 1-inch minus as specified in Section 2300, or as shown on the Plans.

2.2 CONCRETE:

- A. Concrete for new curbs and/or curbs & gutters shall be 3,500-psi redi-mix, ASTM C94 as specified in Section 2000.
- B. Slump tolerance shall not exceed ± 1.0 -inch of the submitted and approved mix design.

2.3 EXTRUSION MACHINES:

- A. Formless concrete extrusion machines may be used for constructing curb and curb and gutter. Machines shall be of suitable design for the intended use, in proper operating condition and capable of maintaining form, alignment and grade.

2.4 FORMS:

- A. Prefabricated steel forms may be used.
- B. Lumber used in forms shall be of 2-inch material dressed to a uniform thickness, and of good sound material, free from loose knots or other defects. Lumber once in forms shall be thoroughly cleaned before being used again. Re-use of forms and form lumber will be permitted only if their condition is approved by the Engineer.

2.5 PREMOLDED JOINT FILLER:

- A. When required, Pre-molded joint filler shall conform to Section 2000 CAST IN-PLACE CONCRETE (2.8).

2.6 CONCRETE CURING COMPOUND:

- A. Curing material shall conform to Section 2000 CAST IN-PLACE CONCRETE (2.9).

2.7 WEEP HOLE PIPE:

- A. Weep hole pipe shall be schedule 40 PVC, minimum.

PART 3 EXECUTION**3.1 EXCAVATION:**

- A. Excavation shall be unclassified and shall include all excavation for curb and gutter and such trimming as may be necessary in the area between the curb and property line, as shown on the Plans or as directed by the Engineer. Excavation for curbs and gutter shall be done in conjunction with the excavation of the street.
- B. Any portion of the curb and gutter subgrade excavated below grade shall be corrected with gravel backfill. Where directed by the Engineer, suitable material as approved by the Engineer may be used for backfill. Such material must be compacted in lifts with mechanically operated tampers. Tamping shall be such that no settlement will occur.

3.2 FOUNDATION STABILIZATION:

- A. Where soft, spongy or other unstable material is found in the subgrade, the Engineer shall require that excavation be carried to firm, solid foundation material, which in his opinion is deemed satisfactory. The subgrade shall then be backfilled to the required grade with gravel for backfill as specified in Section 4200. This item shall include the excavation necessary to provide space for the foundation stabilization material.

3.3 FORMS:

- A. Forms shall conform to the shape, lines, grades and dimensions of the concrete as hereinafter provided for or as called for on the Plans. The inside of forms shall be coated with a light, non-staining mineral oil. Forms shall be held firm and rigid to permit thorough consolidation (i.e. tamping or mechanical vibration) of the concrete.
- B. Curb, and Curb and Gutter Forms. The finished curb will conform to the curb and curb and gutter detail on the Standard Street and Drainage Details drawing. Horizontal and vertical alignment of forms shall be such that the finished surface shall not vary more than 1/4-inch from the established grade. Scored plywood may be used to affect the short radius bends required for curb and gutter returns.

3.4 EXTRUSION MACHINES:

- A. Curb extrusion machines shall be operated by experienced, competent persons in such a manner that the finished curb will conform to the Standard Detail Sheet as shown on the Plans.

Horizontal and vertical alignment shall be maintained such that the finished surface shall not vary more than 1/8-inch from the established grade.

3.5 EXPANSION/CONTRACTION JOINTS:

- A. Shall be installed and located where curbs or curbs & gutters are in contact with structures of dissimilar size, grade and/or material and as called for on the plans or as directed by the Engineer.
- B. Expansion joints shall be constructed of pre-molded joint filler and shall be placed in the forms in the proper position before concrete is poured. Nails at approximately 1-foot on centers shall be driven through the filler so as to extend into the concrete when it is poured and hold the filler in position. Joints shall be installed in curb and gutter at the ends of all returns and at not more than 15-foot intervals.
- B. Joint filler shall extend 1-inch above curb line and through the entire cross section of the curb and gutter. Joints shall be properly finished on both the face of the curb and on the top of the curb and gutter. After curing of the concrete has been completed, the joint filler shall be cut flush with the adjoining surfaces.

3.6 CONSTRUCTION JOINTS:

- A. Curbs shall have approved joints at the ends of all curb returns and at not more than 15-foot intervals or as directed by the Engineer.

3.7 PLACING CONCRETE:

- A. Before depositing of concrete will be permitted, the work crew and all equipment and tools must be on the job site. Before depositing concrete, all debris shall be removed from the space to be occupied by the concrete. The base shall be thoroughly wetted, but no pools of water will be permitted.
- B. Concrete shall be deposited in its proper place without delay in a continuous operation. An interval of more than 45-minutes between any 2 consecutive batches or loads, or a placing rate of less than 8-cubic yards of concrete per hour, shall constitute cause for a construction joint at the location and of the type directed by the Engineer in the concrete already placed.
- C. In extremely hot weather, concrete in place shall be protected until final finishing can be completed. With a hot, dry breeze, windbreaks may be erected, or fog nozzles may be used. Curing operation should begin as soon as concrete has set enough to avoid surface damage.

3.8 FINISH:

- A. Curbs and/or curb & gutter faces shall be broom finished and in directions shown on Plans.

3.9 REMOVAL OF FORMS:

- A. The form on the front of the curb or wall shall be removed in not less than 2-hours nor more than 6-hours after the concrete has been placed. Forms on the back of curbs and walks shall remain in place for at least 1-day, but in no event shall the form be removed if the concrete has not reached its initial set.
- B. Point or patch all exposed faces for holes left after the removal of form ties. Patching mixture shall consist of one part cement and two parts mortar sand. In general, it is not anticipated that patching will be required. Plywood or metal forms shall be used to produce a uniformly smooth surface on the exposed face. The use of form ties buried in the curb and gutter or wall must have the prior approval of the Engineer, and then only to suit a special forming problem, or as part of the integral design of a prefabricated and manufactured standard curb and gutter form. The interior of the catch basin shall be smooth.
- C. Grinding exposed faces with carborundum stones shall not be allowed. Substandard finishing and the presence of rock pockets shall be sufficient cause for rejection by the Engineer.

3.10 CURING OF CONCRETE:

- A. Protection against loss of moisture shall be accomplished by keeping the surface continuously wet for 7-days, or by application of an approved curing compound applied immediately after completion of the finishing.

3.11 WEEP HOLES:

- A. Weep holes shall be constructed through curbs to the gutter line as shown on the Standard Details.
- B. See Standard Detail No. 4100-3.

3.12 MEASUREMENT AND PAYMENT:

- A. Payment will be based up the unit price in the Bid for work completed and measured in the field to the nearest 0.1-linear foot.

PART 4 TESTING**4.1 GENERAL:**

- A. At the direction of the Engineer a sample of the material shall be taken and tested by a qualified testing laboratory for gradation, density, compaction and/or other properties as specified herein.

END OF SECTION

SECTION 4150

PART 1 GENERAL

1.1 SCOPE:

- A. This work consists of the construction of PCC sidewalks, paths, driveways, entrances and ADA ramps for both new construction as well as rehabilitation improvements.
- B. Place, construct, and install PCC structures as specified herein in accordance with Standard Details:

PART 2 PRODUCTS

2.1 AGGREGATE BASE FOR GRADING:

- A. Aggregate base material shall be 1-inch minus crushed rock and conform to the requirements of Section 2300 of the Standard Construction Specifications.

2.2 PORTLAND CEMENT CONCRETE (PCC):

- A. Shall conform to Section 2000 of the Standard Construction Specifications.
- B. Use high early strength concrete to obtain 3,500-psi compressive strength at the age of 3-days for existing driveway rehabilitation work so residents may access their driveways in 3-days or less.

2.3 BITUMINOUS HOT MIX ASPHALT (HMA):

- A. Bituminous HMA shall conform to Section 2400 of the Standard Construction Specifications.

2.4 EXPANSION/CONTRACTION JOINT MATERIALS:

- A. Joint materials, when required, shall conform to Section 2000 of the Standard Construction Specifications.

2.5 CURING MATERIALS:

- A. Curing materials shall conform to Section 2000 of the Standard Construction Specifications.

2.6 STEEL REINFORCEMENT:

- A. When required for commercial and industrial sidewalks and driveway approaches use steel conforming too and placed in accordance with Section 2100 of the Standard Construction Specifications.

SECTION 4150

PART 3 EXECUTION

3.1 DEMOLITION AND REMOVAL OF EXISTING:

- A. All concrete and asphalt to be removed for installation of replacement structure shall be vertically saw cut to ensure neat vertical face to adjoin new.
- B. Debris (i.e., concrete, asphalt, unclassified excavations and etc.) shall be removed from site to a state approved landfill.
- C. Removal of existing concrete driveways, pathways and the like shall be incidental to the unit price of constructing new.

3.2 EARTHWORK:

- A. Earthwork shall conform to the requirements of Section 3100 of the Standard Specifications.
- B. Clearing and grubbing, excavation, haul of waste material, and import of subgrade material shall be incidental to placement of sidewalks and driveways.

3.3 AGGREGATE BASE:

- A. Aggregate base shall be placed in a uniform manner to the thickness shown on the plans and compacted to a cohesive mass to provide best aggregate interlock and deter unnecessary saturation of concrete, and to limits herein;

1.	Under Sidewalks & Paths	92%	AASHTO T-180
2.	Under Driveways & Entrances	95%	AASHTO T-180

- B. The aggregate base shall be thoroughly dampened prior to placing PCC.

3.4 FORMING:

- A. Forming shall conform to Section 2000 of the Standard Construction Specifications.

3.5 MIXING AND DELIVERY OF PCC:

- A. Mixing and delivery of PCC shall conform to Section 2000 of the Standard Construction Specifications.

3.6 PLACING PCC:

- A. Placing of PCC shall be in conformance to Section 2000 of the Standard Construction Specifications.
- B. Where weep holes are called out on the plans and run under sidewalks and/or any other concrete

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pathways the carrier pipe shall have a min. of 2/3 the thickness as cover.

3.7 FINISHING OF PCC:

- A. Broom finish all exposed surfaces and in the direction(s) shown on the Plans.
- B. Provide a 3-inch shine on all edges and at joints.

3.8 CURING OF PCC:

- A. Curing of PCC shall conform to Section 2000 of the Standard Specifications.

3.9 PROTECTION OF PCC:

- A. Contractor shall protect PCC in conformance to Section 2000 of the Standard Construction Specifications.

3.10 SINGLE FAMILY RESIDENTIAL DRIVEWAYS AND ENTRANCES:

- A. Single Family Residential driveways and entrances shall be as shown on the Plans and listed as follows;

1-inch minus crushed aggregate base	4-inches thick
PCC	6-inches thick
#4 def. bar reinforcement	None

- B. See Standard Detail No.4150-1.

3.11 ALL OTHER DRIVEWAYS AND ENTRANCES:

- A. All other driveways and entrances shall be as shown on the Plans and listed as follows;

1-inch minus crushed aggregate base	6-inches thick
PCC	8-inches thick
#4 def. bar reinforcement	12-inches O.C.

- B. See Standard Detail No. 4150-1.

3.12 SIDEWALKS:

- A. Construct Sidewalks of PCC as specified in Section 2000 and with a 28-day compressive strength of 3,500-psi.
- B. Sidewalks that cross through all driveways and vehicular traffic paths shall be of the same structural dimensions as the driveway.

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- C. Sidewalks in all other cases shall be as shown on the Plans and listed as follows;

1-inch minus crushed aggregate base	4-inches thick
PCC	4-inches thick
- D. Broom finish sidewalks in a transverse direction to normal travel, as shown on plans, and provide a 3-inch edge shine and at joints.
- E. Provide expansion/contraction joint filler material, as specified in Section 2000, when new constructed sidewalks encounter different structures and as directed by the Engineer.
- F. See Standard Detail Nos. 4150-3, 4150-4, 4150-7 and 4150-8.

3.13 ADA RAMPS:

- A. CONFLICT IN REGULATIONS: ADA ramps shall conform to the latest Federal and State of Oregon regulations and the American's with Disabilities ACT and shall supersede these specifications.
- B. WARNING PANELS AND TILES: Precast engineered warning panels shall be safety yellow in color. Catalog cut sheets and samples shall be submitted to the Engineer prior to construction for approval. The Engineer will make final judgment in the acceptability of the product for the application.
- C. GRADE AND DIMENSION: constructed ADA ramps in accordance to the Plans, unless in conflict with 3.13(A) then to the more stringent requirement, and the same as adjoining sidewalk requirements for each case and in accordance with the Standard Details.
- D. MATERIAL: Construct ADA ramp (except warning panel/tile) out of PCC as specified in Section 2000 with a 28-compressive strength of 3,500-psi.
- E. See Standard Detail Nos.4150-5 and 4150-6.

3.14 DRIVEWAY & ACCESS APPROACH REAHABILITATIONS:

- A. Overall width of approach rehab. repairs shall be 24-inches as measured from the face of the curb, min. Depth of driveway replacement can be greater if required by the Engineer, and acceptable to property Owner, to accommodate drainage, grade and/or construction to adjacent structure.
- B. Construct approach rehab. out of PCC as specified in Section 2000 using Type III or IIIA (high early strength) and achieving a compressive strength of 3,500-psi in 3-days. Local traffic shall be able to have access back within 3-days, max.
- C. See Standard Detail No. 4150-2

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3.15 MEASUREMENT AND PAYMENT:

- A. EXISTING DRIVEWAY, SIDEWALK, ADA RAMP AND APPROACH REMOVAL - Payment shall be made at the contract unit price for each, itemized separately. The contract price shall be full compensation for saw cutting, excavation, hauling and disposal of removed structure to include throat(s) and inclined wing(s). Adjacent curb shall not be included in this payment item, however, monolithic curb attached at the throat of the driveway is included in the area measurement. This pay item shall be for demo of existing structures not being replaced by new. New structures will include demo in the unit price of the new.
- B. NEW SIDEWALKS - Payment shall be made at the contract unit price for Sidewalks - complete. The contract price shall be full compensation for demolition of existing concrete sidewalk structures, unclassified excavation, sub-base preparation, base aggregate installation and preparation, forming, PCC placement, finishing and curing. This shall not include the section of sidewalk, which is described in 3.15(C), of this Section, through the driveway. Adjacent curb shall not be included in this payment item.
- C. NEW DRIVEWAYS - Contract shall indicate separate bid items for single family residential and "all other" driveways and entrances - complete. Payment shall be made at the contract unit price for driveways. The contract price shall be full compensation for demolition of existing concrete driveway structures, unclassified excavation, sub-base preparation, base aggregate installation and preparation, forming, concrete placement, finishing and curing. This shall include the section of sidewalk through the driveway and inclined wings on both sides of the throat of the driveway. Adjacent curb shall not be included in this payment item.
- D. NEW ADA RAMPS - Payment shall be made at the contract unit price for ADA Access Ramp(s) - complete. The contract price shall be full compensation for demolition of existing concreted ADA ramps, unclassified excavation, sub-base preparation, base aggregate installation and preparation, forming, concrete placement, finishing and curing. This shall include the section of sidewalk through the ADA ramp and inclined wings on both sides of the throat of the ramp. Adjacent curb shall not be included in this payment item.
- E. NEW DRIVEWAY APPROACH REHABILITATION - The contract price shall be full compensation for demolition of existing concrete approach structures, unclassified excavation, sub-base preparation, base aggregate installation and preparation, forming, concrete placement, finishing and curing. This shall include the section of driveway slab measuring 18-inches behind the curb cut and inclined wings on both sides of the throat of the driveway. Adjacent curb shall not be included in this payment item.

PART 4 TESTING

4.1 EARTHWORK:

- A. When requested by the Engineer, earthwork shall be sampled and tested in accordance with Section 3100 of the Standard Specifications.

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4.2 AGGREGATES:

- A. When requested by the Engineer, aggregates shall be sampled and tested in accordance with Section 2300 of the Standard Specifications.

4.3 CONCRETE:

- A. Concrete cylinders shall be prepared by a certified laboratory for testing along with slump, air entrainment, yield, and unit weight in accordance with ASTM C138 and ASTM C143.

4.4 EXPANSION JOINT FILLER:

- A. When required, joint filler shall be tested in accordance with ASTM D1752.

4.5 TOLERANCE:

- A. Line and grade may not vary more than 0.02-foot when tested with a 10-foot straight edge except at grade changes or vertical curves.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section establishes the work to place hot-mix bituminous pavement Class B, C, and/or D as specified on the plans.

1.2 DEFINITIONS:

- A. **HOT MIX ASPHALT CONCRETE (HMAC)** - Asphalt concrete is a hot mixture of asphalt cement; well graded, high-quality aggregate; and mineral filler and additives as required; plant mixed into a uniformly coated mass, hot laid on a prepared base, and compacted.
- B. **RECYCLED ASPHALT PAVEMENT (RAP)** - RAP is processed recycled asphalt pavement materials used in the production of new asphalt concrete pavement. The RAP materials proposed for use in the recycled mix shall contain hard, sound, durable aggregates and asphalt cement.

PART 2 PRODUCTS

2.1 GENERAL:

- A. HMA product shall conform to Section 2400 of these Specifications and be a mix design submitted by the Contractor and approved by the Engineer for use on this specific project.

PART 3 EXECUTION

3.1 PRE-PAVING CONFERENCE:

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

3.2 WEATHER LIMITATIONS:

- A. Asphalt concrete shall be placed on a dry prepared surface when the surface temperature is not less than 55°F and the ambient temperature is above 54°F - and rising.
- B. Asphalt concrete shall not be placed during rain or other adverse weather conditions, except that mix in transit at the time these adverse conditions occur may be laid if the mix has been covered during transit and is at the specified temperature, if the foundation is free from pools or flow of water, and if all other requirements of these specifications are met. Asphalt concrete mixtures shall not be placed when the foundation is frozen or when, in the opinion of the Engineer, existing or expected weather conditions will prevent the proper handling, finishing, or compaction of the mixtures.

3.3 TRUCK SCALES:

- A. Each payload of asphalt concrete mixture shall be weighed on vehicle scales licensed by the Oregon Department of Agriculture. The Contractor shall be responsible for maintaining the scales in an accurate condition at all times.
- B. If the accuracy tests reveal scales have been indicating less than the true weight, no additional payment will be allowed for previously weighed materials. If the tests reveal that scales have been indicating more than the true weight, all materials received since the last passing accuracy test, or the time at which the Engineer determines the problem occurred, will be reduced by the amount of error in excess of the tolerance allowed by state law.
- C. Each load of mixture shall have a weigh memo provided by the Contractor.

3.4 HAULING EQUIPMENT:

- A. Vehicles used for hauling asphalt concrete mixtures shall have tight, clean, and smooth beds which have been thinly coated with paraffin oil, lime solution, soapy water, or other approved material to prevent mixture from adhering to the beds. Diesel oil may be used when requested by the Contractor and approved by the Engineer. During each application of approved coating material, and prior to loading the vehicle bed shall be drained of all excess coating material.
- B. Hauling vehicles shall be equipped with covers to protect against intrusion and heat loss.
- C. Vehicles that cause segregation, leak badly, or delay normal operation shall not be used.

3.5 ASPHALT CONCRETE PAVERS:

- A. Pavers shall self-contained, power-propelled units with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing layers of asphalt concrete material to the widths, thickness, lines, grades, and cross sections required.
- B. The paver shall be equipped with receiving and distribution system of sufficient capacity for a uniform spreading operation and capable of placing the mixture uniformly in front of the screed without segregation of materials. Extensions added to the paver when used on travel lanes shall have the same auguring and screeding equipment as the rest of the paver.
- C. The screed or strike-off assembly shall produce a finished surface of the required smoothness and texture without tearing, shoving, or gouging the mixture. The paver shall be equipped with either a manual (string) or electronic line grade control.

3.6 COMPACTORS:

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

1. STEEL WHEEL ROLLERS - Steel wheeled rollers shall have a minimum gross static weight of 8-tons and a minimum static weight on the drive wheel of 250-pounds per inch of width. For finish rolling a 6-ton minimum gross static weight is acceptable and the 250-pounds per inch of width will not be required.
2. VIBRATORY ROLLERS - Vibratory rollers shall be equipped with amplitude and frequency controls and shall be specifically designed for compaction of asphalt concrete mixture. The rollers shall be capable of frequencies of not less than 2,000 vibrations per minute.
3. PNEUMATIC ROLLERS - The pneumatic-tired rollers shall be self propelled, tandem, or multiple axle, multiple wheeled with smooth tread pneumatic tires. The tires shall be of equal size and staggered on the axles at spacings and overlaps that will provide uniform compacting pressure for the full compacting width of the roller. Ground pressures shall be at least 80 psi of tire contact area. Pneumatic-tired rollers shall be fully skirted to insulate the tires from significant heat loss during compaction.

3.7 PREPARATION OF FOUNDATION:

- A. All bases and foundations on which the pavement is to be constructed, shall meet applicable specifications and be approved prior to the start of paving. Existing bases and foundations shall be reconditioned as specified or directed.
- B. Broken or ragged edges of existing paved surfaces underlying or abutting the new pavement shall be trimmed back to firm material.
- C. Depressed areas in existing pavement shall be tacked and leveled with an approved asphalt concrete mixture and compacted. This leveling work shall be a separate operation and performed as specified.

3.8 ASPHALT CONCRETE STORAGE:

- A. Storing or holding of hot asphalt concrete mixture in open stockpiles shall not be permitted.

3.9 DELIVERY, STORAGE, AND HANDLING OF AGGREGATES:

- A. During production, hauling and storage, aggregates shall be handled in a manner that will prevent segregation of materials or intermingling of separate grades or kinds of aggregates. Covers shall be used to protect the mixture when adverse weather or cold air temperature is encountered during hauling.

3.10 CONTROL OF LINE AND GRADE:

- A. The Contractor shall furnish, place, and maintain supports, wires, devices, and materials as necessary to provide continuous line and grade reference control to the automatic paver control system on either or both sides of the paving machine.

3.11 TEMPERATURE OF MIXTURE:

- A. The temperature of the mixture at the time it is placed in final position shall be within 10-degrees of 280⁰ F. The Engineer may adjust the lay-down temperature in 10-degree increments to attain maximum workability and compaction. In no case shall the lay-down temperature of mixture be less than 240⁰ F.

3.12 FINISHING AND DETAILS

- A. Segregation of materials, non-uniform texture, fouled surface preventing full bonding between lifts of mixture, and other defects determined by the Engineer as detrimental, shall be corrected by the Contractor at no expense to the Owner.

3.13 TRANSVERSE JOINTS:

- A. On wearing courses, pavement depth, line, and grade shall be maintained at least 4 feet beyond the selected transverse joint location. On all courses, a sloped end section shall be constructed. If subject to traffic, the end section shall be sloped at not less than 50:1. If not subject to traffic, the end section shall be sloped at a minimum of 10:1.
- B. When paving is not expected to continue from the transverse joint until the following day or later, paper, squared 2x4 or other suitable material shall be placed under the material ahead of the transverse joint location to ensure a vertical face to pave against.
- C. Prior to continuing the permanent paving lift, the Contractor shall remove the material beyond the joint to a vertical face against which paving will resume. The base shall be cleaned of all debris. A tack coat shall be applied to the vertical edge and surface of the exposed area before paving is continued.
- D. After placement and finishing of the new asphalt concrete, both sides of the joint shall be compacted to the specified density. The joint surface shall conform to the requirements of subsection 3.16.

3.14 THICKNESS AND NUMBER OF LAYERS:

- A. The mixture shall be placed in the number of lifts and to the compacted thickness of each lift as shown on the Plans. If the compacted thickness of each lift is not shown on the Plans, the maximum compacted thickness for any lift shall be 3-inches.

3.15 COMPACTION:

- A. Immediately after the asphalt concrete mixture has been spread, struck off and surface irregularities and other defects remedied, it shall be thoroughly and uniformly rolled until the mixture is compacted.
- B. The type, number, and weight of rollers shall be sufficient to compact the mixture while it is still within the specified temperature range.

- C. Steel roller wheels shall be moistened with water to the least extent necessary to prevent pickup of mixture and not cause spotting or defacement of the surface of the mixture.
- D. Rollers shall be operated at speeds recommended by the roller manufacturer and slow enough to avoid displacement of the mixture. The maximum speeds shall be 3-miles per hour for vibratory rollers, 4-miles per hour for steel-wheeled rollers, and 5-miles per hour for pneumatic-tired rollers.
- E. Care shall be exercised not to displace the line and grade of edges. Displacement of any course occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of approved rakes and addition of fresh mixture when required. Any mixture that becomes loose and broken, contaminated, segregated, or is in any way defective, shall be removed and replaced with new mixture at no expense to the owner.
- F. Finish rolling shall continue until all roller marks are eliminated.
- G. Along curbs and walls, on walks, irregular areas, due care shall be exercised to not damage adjoining structures such as sidewalks, curbs, gutters, catch basins, and/or but not limited to vaults.
- H. DENSITY REQUIREMENTS
 - 1. For a specified lift thickness less than 1-1/2-inches, the mixture shall be compacted to the maximum limits established with thin lift correction factor method.
 - 2. For a specified lift thickness of 1-1/2-inches or greater, the mixture shall be compacted to at least 92-percent of the theoretical maximum density as determined by ODOT TM 306.

3.16 PAVEMENT SMOOTHNESS:

- A. The top surface of the asphalt concrete pavement shall not vary by more than 0.02-foot when tested with a 12-foot straightedge either parallel with or perpendicular to the centerline. The straightedge shall be furnished and operated by the Contractor. The Engineer will observe this testing and may require additional testing.
- B. The joint between the pavement and the top surface of utility structures, such as manhole covers and valve boxes located in the traveled way, shall meet the pavement surface tolerances.
- C. The surface of the finished pavement shall be within 0.02-foot of the specified line, grade and cross section.
- D. The Contractor shall correct any surface tolerance deficiency by a method that has been approved by the Engineer. All corrective work shall be completed within 10 workdays following notification from the Engineer. All corrective work, including furnishing of materials, shall be performed at the Contractor's expense and no adjustment in Contract time will be made.

3.17 SPECIAL PROTECTION UNDER TRAFFIC:

- A. No traffic or equipment shall come in contact with the compacted mixture until it has cooled and set sufficiently to prevent marking. Edges shall be protected from being broken down, and edge DROP-OFFS 1-inch or more in height shall be marked with warning devices visible by day and night to the traveling public and spaced as specified or as directed by the Engineer.
- B. When it is necessary to put traffic back on fresh hot-mix sooner than is optimum place a dusting of masonry sand over the surface to eliminate/reduce tearing of fresh surface.

3.18 TEMPORARY PAVEMENT MARKINGS:

- A. During paving operations, lane markings shall be maintained throughout the project by applying temporary lane stripes to the roadway each day. Temporary striping shall consist of strips of pavement marking tape a minimum of 1-foot in length on the lane separation line to delineate the path of travel for vehicles. Intervals between marking strips shall be a maximum of 25-feet.
- B. The pavement marking tape shall be 4-inches wide, pressure sensitive, reflective tape of a form suitable for marking asphalt or concrete pavement surfaces. Biodegradable tape with paper backing will not be allowed. Surface preparation and application shall be in conformance with the Manufacturer's recommendations.
- C. The pavement marking shall be maintained in serviceable condition by the Contractor during the interval of time it is in use. All preliminary layout and marking in preparation for application of the temporary striping shall be the Contractor's responsibility. If specified, the Contractor shall remove the temporary striping prior to placement of subsequent paving materials or permanent lane markings.

3.19 MEASUREMENT AND PAYMENT:

- A. HMAC: Shall be measured, in the field from weigh tickets, and paid to the nearest 0.1-Ton per Class of mix placed. If the HMAC placed is found to be out of the JMF tolerances, see Section 2400(2.9)(A)(Table A-7), the mat shall be either removed or be required an extended guarantee period.

Length of time to be determined by the Engineer based upon consideration of the overall deviation of the mix placed.

- B. DENSITY: If the completed project does not meet compaction requirements, final pay may be adjusted by Table C-1. Use maximum density when working with Rice value and target when working with test strip or thin-mix overlay correction factor.

TABLE C-1		
PRICE REDUCTION SCHEDULE		
% MAXIMUM DENSITY	% PAY	% TARGET DENSITY
92.0 >	100	98.0 >
91.5 – 91.9	98	97.5 – 97.9
91.0 – 91.4	97	97.0 – 97.4
90.5 – 90.9	95	96.5 – 96.9
89.5 – 89.9	90	96.0 – 96.4
89.0 – 89.4	85	95.5 – 95.9
< 89.0	0 - 50	< 95.0

- C. **THICKNESS:** If the completed project does not meet thickness requirements, final pay may be adjusted as follows.

TABLE C-2		
% Reduction in Pay (Payment by Ton)	% Deficiency (Thickness)	% Reduction in Pay (Payment by Area)
0	0.0 – 5.0	0
0.5 x Deficiency	5.1 – 10.0	1.0 x Deficiency
0.75 x Deficiency	10.1 – 20.0	1.5 x Deficiency
1.0 x Deficiency	20.1 – 30.0	2.0 x Deficiency

- E. **LOT:** A paving lot will be determined by 500-tons of HMAC placed or one days completed paving work.

3.20 INLET PROTECTION:

- A. Place filter fabric over all catch basin inlets to ensure HMAC is restrained from entering the public drainage system. In the event HMAC is passed to inlet(s) the Contractor shall clean it to the satisfaction of the Engineer.

PART 4 TESTING

4.1 SAMPLING AND TESTING:

- A. The Contractor is responsible for process control and shall conduct sampling, testing, measurement and inspection as necessary to insure the finished pavement meets specifications.
- B. The Engineer will determine the suitability of the final product through final acceptance testing. Results of these tests will be used to determine payment deductions, if any, to be assessed against the Contract.
- C. The Engineer shall be permitted to cut samples or to take cores from the compacted mixture for testing purposes. Where samples have been taken, the Contractor shall furnish new material and fill the holes as directed with no compensation beyond the unit price for asphalt concrete in place.

4.2 AGGREGATE GRADATION AND ASPHALT CONTENT:

- A. The Contractor shall take samples from the grade on a random basis in the presence of the inspector for testing by the engineer. A minimum of three (3) samples may be taken for each lot of HMAC.

4.3 COMPACTION:

- A. For final acceptance of the pavement, the density of each section of pavement will be determined by random tests using a nuclear gauge or laboratory analysis of pavement core samples. Density tests will be taken at three (3), or more, randomly selected sites for each section of pavement. The average of the three (3) density tests will constitute the density of the pavement.
- B. Acceptance tests will not be made within one 1-foot of the edges of the panel or from areas where the specified compaction thickness is less than ½-inch.
- C. When using a nuclear gauge, two readings will be obtained at each site, the second at right angles to the first. The two readings will be averaged to obtain the test density. For any section of pavement, if the Contractor requests in writing within two work days after nuclear gauge test results are furnished to the Contractor, pavement cores will be obtained at the same randomly selected sites used for the nuclear gauge tests. The density of the core samples will be determined by an independent testing laboratory. The average density of the core samples will constitute the in-place density of the lot of pavement and will prevail over nuclear results. If the density as determined by the core samples does not meet density requirements, the Contractor shall bear the cost of coring and testing.
- D. The Engineer shall have the right to conduct any testing deemed necessary to verify compaction results. Pavement found to be out of specification shall be subject to replacement or to payment adjusted prices in accordance with (3.19)(B)(Table C-1).

4.4 PAVEMENT THICKNESS:

- A. The Engineer will select locations for non-destructive measurement or core samples to determine pavement thickness.
- B. If non-destructive measurement indicates a pavement section is less than the thickness shown on the Plans, or is otherwise out of specification, the Contractor may take cores at the same location to verify the Engineer's measurements. If the pavement section is found to comply with specifications, the coring and restoration will be paid for as extra work. Pavement found to be out of specification shall be subject to replacement or to payment adjusted prices in accordance with (3.19)(C)(Table C-2).
- C. In determining deficient or excessive thickness in asphalt concrete overlays, the Engineer shall adjust the cross section measurement sequence, average series of measurements, or take other appropriate steps to allow for the desirable leveling of low or high areas on the existing pavement.

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

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This section covers the work necessary for furnishing, fabricating, erecting and removal of signs and sign structures and furnishing and installing striping and pavement markings.
- B. For standard street sign and post installation see Standard Detail 4300-1.

PART 2 PRODUCTS

2.1 CONCRETE SIGN POST ANCHOR:

- A. PCC for placing sign post in shall conform to Section 2000 of these specifications and shall be 3,500-psi, ASTM C94 (Option A).

2.2 SIGN MATERIAL:

- A. Traffic control signs shall conform to ODOT Section 02910 – Sign Materials.

2.3 SIGN POST MATERIAL:

- A. Traffic control sign post shall be schedule 40, hot galvanized post pipe of 2-3/8-inch diameter. Other material, size(s) and/or dimension will be approved on a case by case basis.

2.4 PAVEMENT MARKING MATERIALS:

- A. Pavement marking materials shall conform to ODOT Section 02840 – Pavement Marking Materials specification.

PART 3 EXECUTION

3.1 TRAFFIC CONTROL DEVICES:

- A. All traffic control devices (sign type, size, and location and pavement markings) shall conform to the Manual on Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration (FHWA).

3.2 MEASUREMENT AND PAYMENT:

- A. Payment will be made at the unit price as indicated in the Bid for quantities completed and field measured as either unit price basis or a lump sum basis.

PART 4 TESTING

4.1 GENERAL:

- A. When in the opinion of the Engineer and at his discretion he may select representative samples to be tested by a certified lab to ensure conformance to these specifications. The cost of initial testing will be born by the Owner. If the samples are found to be in nonconformance any retesting cost will be paid by the Contractor or deducted from any monies due him.

END OF SECTION

DIVISION 5 – WATER

<u>SECTION</u>	<u>DESCRIPTION</u>
SEC. 5000	Waterline Installation
SEC. 5050	Valves and Meters
SEC. 5070	Fire Hydrants
SEC. 5100	Water Main Disinfection

PART 1 GENERAL

1.1 SCOPE

- A. This Section consists of furnishing and installing water pipe and fittings normally used for water distribution systems.
- B. Reference Section 3800 “Trenching and Backfill” and the General Conditions, specifically, but not limited to, Articles E.8, E.9, E.10, H.3, H.4, H.5 and H.6.

PART 2 PRODUCTS

2.1 GENERAL:

- A. Contractor shall furnish materials certification for all required materials.
- B. All material shall be new and of U.S. manufacture including valves, pipe, fittings and etc. unless approved prior to installation through the submittal process.

2.2 BEDDING AND BACKFILL MATERIAL:

- A. Bedding and backfill materials shall conform to Section 2300.

2.3 PIPE:

- A. All pipe materials for watermains shall be ductile iron pipe unless approved otherwise and shall further conform to Section 2600..

2.4 THRUST BLOCKS:

- A. Thrust blocks, for pressure lines, shall be made of cast-in-place redi-mix with a 28-day compressive strength of 3500 psi. Thrust blocks shall further conform to Section 2000 and Standard Detail Nos. 5000-1, 5000-2 and/or 5000-3 (for vertical TB).
- B. Precast blocks **SHALL NOT** be accepted in place of cast-in-place thrust blocks.

2.5 BACKFLOW PREVENTERS:

- A. No system shall be allowed that may in the opinion of the Engineer be cause for a cross connection of the Owner's water supply system.
- B. Backflow preventer(s) shall be installed as specified and in accordance with the Cities Cross-Connection Ordinance as supervised by the Public Works' Water Division Inspector. The inspector can be reached and scheduled by calling 503.982.5380.

2.6 WATER METER:

- A. Water meters shall be the type supplied by the City Water Department.

2.7 VALVES:

- A. Eccentric Plug Valves (EPV), gate valves, ball valves, air relief /vacuum valves, and etc. shall comply with Section 5050.

PART 3 EXECUTION**3.1 HANDLING AND STORAGE:**

- A. All material (pipes, fittings, and etc.) shall be handled with care to avoid damage. Material shall not be dropped, bumped, or allowed to impact on itself.
- B. The Contractor shall provide safe storage for material until it has been incorporated into the work. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and other foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing and high water. The Contractor at no expense to the Owner shall replace damaged materials.
- C. While cleaning pipe and fittings, wire brush if necessary and wipe clean, dry and free from oil, dirt, grease, and other foreign matter before the pipe is laid. If pipe is exposed to debris to a detriment to the water system in the opinion of the Engineer pipe shall be swabbed with a chlorine solution as directed by the Engineer.
- D. All pipes and fittings shall be carefully inspected before being laid and no cracked, broken, or defective pipe or fitting shall be used in the work.

3.2 TRENCH EXCAVATION, BACKFILL, AND BEDDING:

- A. Trench excavation shall conform to Section 3800 of these Specifications.

3.3 PIPE ALIGNMENT AND GRADE:

- A. All pipe shall be laid to and maintained at the lines and grades required by the Plans. All fittings and valves shall be installed at the required locations with joints centered, spigots home, and plumb.
- B. Every fourth section of pipe 10-foot and over shall be checked for depth of cover or every 50-foot for pipe sections under 10-foot.
- C. When a section or sections are found to be out of alignment or grade they shall be removed and placed at the correct alignment and/or grade. If fill is required to readjust use 1-inch minus aggregate thoroughly compacted to the satisfaction of the Engineer.

- D. Maximum deviation from true line or grade, as established by the Engineer, shall not exceed ½-inch for line and grade.
- E. In the course of laying pipe if a conflict occurs with a crossing utility which can not be relocated dive the water main under the utility unless approved by the Engineer to avoid high points allowing for air entrapment. Ensure deflection vertically to be in accordance with the manufacturer's recommendations and approved by the Engineer.

3.4 PIPE INSTALLATION:

- A. Installation of ductile iron pipe shall conform to AWWA C 600 and as further noted herein.
- B. Prior to excavation Contractor shall call for utility locating services of all existing utilities. Care shall be exercised during excavation to avoid damage to existing structures and utilities.
- C. Obstructions encountered shall be handled in accordance with Article E(8) of the General Conditions, except they conflict with 3.3(D) and/or 3.14.
- D. Under no circumstance shall pipe be place in standing water.

3.5 VALVES, FITTINGS, PLUGS AND CAPS:

- A. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified. Valves 12-inches and larger shall be provided with special support such as crushed rock or concrete pads so that the pipe does not support the weight of the valve. Adjacent pipe shall be supported so as to prevent stress on the valve.
- B. Valves shall not be used to bring misalign pipe into alignment during installation.
- C. All dead ends on new mains shall be equipped with blow-off assemblies and shall be closed with plugs or caps suitably restrained to withstand test pressure. Blow-off assemblies preceding the plugs or caps shall be restrained, and as shown in Standard Detail No. 5000-5.
- D. Valve installation shall otherwise conform to Section 5050.

3.6 SERVICE LINES:

- A. Service lines shall be installed in a work-man-like manner and in accordance with the Standard Detail No. 5000-4.
- B. Take care to ensure that copper Type K tubing is not bent or crinkled in a fashion to reduce flow and/or cause a leak.

3.7 BACKFLOW PREVENTION:

- A. Backflow preventer(s) shall be installed and approved as specified in sub-section 2.5.
- B. A copy of the ordinance can be obtained from Mr. Larry Arendt of the Wastewater Treatment

Plant at 503.982.5283.

3.8 MAXIMUM ALLOWABLE JOINT DEFLECTION:

- A. Maximum allowable joint deflection shall be no more than allowed by the manufacturer's recommendation or in accordance with AWWA C 600, Table-4; which ever is more stringent.

3.9 VALVE BOXES, METER BOXES AND VAULTS:

- A. Valve boxes, meter boxes and vaults shall be installed so as not to transmit shock or stress to the valve. The box cover shall be flush with finished surface of the area in which it is installed. Valve operating nut shall be accessible and centered in the opening of the box.

3.10 CUTTING OF PIPE:

- A. The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.
- B. All interior lining or exterior coating disturbed by cutting of the pipe shall be field dressed to the satisfaction of the Engineer.

3.11 THRUST BLOCKING:

- A. Thrust blocks shall be constructed upon and against firm, consolidated native soils.
- B. Wrap fittings with black plastic to protect coverage of joints and bolts on pipe for future maintenance.
- C. Construct thrust blocks with 3500-psi redi-mix concrete that conforms to Section 2000 of these Specifications.

3.12 SERVICE TAPS:

- A. Service Hot-Taps shall be performed by City Water Department for all live mains.
- B. Corporation stops shall be installed after pipe installation. All service taps on lines larger than 4-inches in diameter shall be direct tap. Four-inch lines shall be tapped with an all brass saddle.
- C. Taps shall be placed at the ten and/or two o'clock position on pipe vertices and a brass corporation installed.
- D. Torque requirements shall be as recommended by the manufacturer for the pipe Class being tapped.

3.13 FLUSHING:

- A. Foreign material left in pipelines during installation often results in valve-or-hydrant-seat leakage during pressure tests. Every effort shall be made to keep line clean during installation. Thorough flushing shall be accomplished prior to a pressure test. Flushing shall be accomplished by partially opening and closing valves and hydrants several times under expected line pressure, with flow velocities of 3 to 5-fps to adequately flush foreign material out of the valves and hydrants.

3.14 WATER METER:

- A. All water meter(s) shall be installed by City Water Division personnel.

3.15 CROSSING OF SEWER LINES:

- A. Sewer lines shall not be in the water main zone as defined in Standard Detail No.5000-6. Encase water mains crossing under or within sewers as specified.

3.16 BLOWOFF ASSEMBLY:

- A. Blowoffs shall be constructed in locations shown on Plans and as shown in Standard Detail No. 5000-5.

3.17 MEASUREMENT AND PAYMENT:

- A. **PIPE:** Pipe will be measured and paid for on a lineal foot basis, to the nearest 0.1-foot, for the types and sizes listed in the bid schedule. No reduction in length will be made for valves and fittings.
- B. **FITTINGS:** Fittings (corporations, angle meter valves, saddles) shall be incidental to unit price for pipe at a lineal foot for each diameter unless specifically listed separately.
- C. **THRUST BLOCKS:** Thrust blocks will be measured and paid for at the unit price per each listed in the bid schedule.
- D. **VALVE AND METER BOXES AND VAULTS:** Valve boxes, meter boxes and vaults shall be measured and paid at the unit price per each for each type listed in the bid schedule.
- E. **SERVICE LINES:** Service lines shall be measured and paid at the unit price to the nearest 0.1-lineal foot for each diameter as listed in the bid schedule.
- F. **REDUCED PRESSURE BACKFLOW PREVENTER (RPBP):** RPBP's shall be paid at the unit price for each as listed in the bid schedule.
- G. **VALVES:** Valves (gate, ball, swing check, double check, EPV, Air/vacuum, and etc.) shall be measured and paid at the unit price for each unless not specified in the bid schedule then they shall be incidental to the work of the pipe main.

PART 4 TESTING**4.1 HYDROSTATIC TESTING:****A. PRESSURIZATION.**

1. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of 150-psi. Each valve section of pipe shall be slowly filled with potable water, and the specified test pressure shall be applied by means of a pump connected to the pipe. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The test system shall be allowed ten minutes to stabilize prior to moving to the next step.
2. Hydrostatic test shall be of at least a 2-hr duration.
3. Test pressure shall not vary by more than 5.0-psi for the duration of the test.

B. AIR REMOVAL.

1. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at such points so that air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be left in place for disinfection sampling points or removed and plugged as directed by the Engineer.

C. FIELD EXAMINATION.

1. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

D. LEAKAGE DEFINED.

1. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled.
2. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

E. ALLOWABLE LEAKAGE.

1. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

In inch-pound units,

$$L = \frac{SD(P)^{0.5}}{133,200}$$

L = allowable leakage, in gallons per hour*

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

P = average test pressure during leakage test, in pounds per square inch (gauge)

**L is in gph and as test is a 2-hr duration total results from field test must be divided by time (hrs) to compare to max allowable to formula. Each hour shall be evaluated separately.*

- F. When testing against closed metal-seated valves, and additional leakage per closed valve of 0.0078 gal/hr/in. on nominal valve size shall be allowed.
- G. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

4.2 ACCEPTANCE OF INSTALLATION:

- A. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in subsection 4.1, repairs or replacement shall be accomplished in accordance with the specifications. All visible leaks are to be repaired regardless of the amount of leakage.

4.3 DISINFECTION:

- A. Disinfection shall be accomplished in accordance with Section 5100 of these Specifications.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section consists of requirements for furnishing and installing water valves and meters.

1.2 CERTIFICATION:

- A. Contractor shall furnish materials certification in accordance with the Special Provisions.

PART 2 PRODUCTS

2.1 GATE VALVES:

- A. Gate valves 3-inches through 48-inches in diameter shall conform to AWWA C500 or C509. Valves shall open when the stem is rotated counterclockwise. Resilient seated gate valves shall conform to AWWA C509.

2.2 BUTTERFLY VALVES:

- A. Butterfly valves shall conform to AWWA C504. Valves shall be Class 150B.

2.3 BALL VALVES:

- A. Ball valves shall conform to AWWA C507.

2.4 CHECK VALVES

A. SWING CHECK VALVES.

- 1. Swing check valves 2-inches through 24-inches in diameter shall be bronze mounted with cast or ductile iron body with outside lever and spring.

B. SPRING-LOADED PLUG OR DISC VALVES.

- 1. Spring-loaded plug or disc valves shall be bronze mounted with bronze, cast or ductile iron body, bronze plug or disc, stainless steel spring and resilient seating suitable for clear cold water service. The plug or disc of the check valves shall be easily replaceable.

2.5 HYDRAULICALLY OPERATED VALVES:

- A. Hydraulically operated valves shall be pilot controlled and diaphragm operated. Valves shall be suitable for 175-psi operation and shall be globe or angle valves. Closing speed shall be adjustable on all valves. Self-cleaning strainers for pilot water supply and valve position indicators shall be provided.

2.6 HYDRAULIC CUSHION VALVES:

- A. Hydraulic cushion valves shall be of bronze, or ductile iron, with bronze disc and disc faces, seat rings, and pivot pins. The valve shall provide drop-tight sealing. Valve shall be provided with an adjustable-speed integrally -mounted oil dashpot mechanical snubber system.

2.7 COMBINATION AIR VALVES:

- A. Combination air valves shall conform to AWWA Standard C512 and permit accumulated air to escape and reenter the line to break any vacuum. Valves shall have cast iron bodies and stainless steel internal furnishings. Valves shall be designed for operating service to 150 PSI. Combination Air Valves shall be Series 201C (Single Body) as manufactured by Val-Matic® Valve Mfg. Corp., Elmhurst, IL. USA or approved equal.
- B. See Standard Detail No.5050-3.

2.8 BACKFLOW PREVENTION DEVICES:

- A. Backflow prevention devices shall be as specified and defined in the *City of Woodburn Cross Connection Ordinance* and as approved by the Oregon Department of Health pursuant to Chapter 333, Division 61 of the Oregon Administrative Rules and Chapter 10 of the Uniform Plumbing Code.

2.9 METERS:

- A. Water meters shall be supplied and installed by City Water Division personnel. Arrangements for scheduling work shall be done through the Engineer in cooperation with the City Water Superintendent.

2.10 SLUICE GATES:

- A. Sluice gates shall conform to AWWA C501.

2.11 VALVE BOXES:

- A. Valve boxes shall be "East Jordan Iron Works Model No. 3639A1 or approved equal.
- B. The cover shall be lug type and clearly marked "WATER".
- C. See Standard Detail No.5050-2.

2.12 BLOW OFFS:

- A. Blow offs shall consist of a 2-inch galvanized pipe attached to the end of the main by means of a mechanical joint with a 2-inch tap extending toward finished grade and capped with a 2-inch wheel gate valve that conforms to Subsection 2.1 of these specifications.
- B. See Standard Detail No. 5000-5.

2.13 METER AND BLOWOFF BOXES:

- A. Meter and blow-off boxes shall be as manufactured by Utility Vault Co. or approved equal and shall conform to Standard Detail No.5050-1.

PART 3 EXECUTION**3.1 VALVES:**

- A. Valves shall be installed so that the shafts are vertical. Jointing procedures shall conform to applicable AWWA specifications.

3.2 METERS:

- A. Meters shall be installed by City personnel. Contractor shall notify the Engineer one week in advance to schedule installation of meters by the City.

3.3 SLUICE GATES:

- A. Sluice gates shall be installed in conformance to AWWA C501 or the manufacturer's recommendations.

3.4 BACKFLOW PREVENTION DEVICES:

- A. Backflow prevention devices conforming to Oregon State Health Division and UPC requirements shall be installed according to the manufacturer's recommendations.

3.5 VALVE BOXES:

- A. Valve boxes shall be centered on the valve shaft. Construction shall conform to Section 5000.

3.6 METER BOXES:

- A. Contractor shall install meter boxes to finished grade and in accordance with the Standard Details.

3.7 BLOW OFFS:

- A. Blow off(s) shall be installed at location(s) shown on plans and in accordance with the Standard Details.
- B. Blow off(s) shall be installed in an oversized meter box and off centered such that the operating wheel of the gate valve is easily accessible from the box opening.

3.8 COMBINATION AIR VALVES:

- A. Combination air valves shall be installed on the zenith of all pressure lines. Pipes shall be tapped and installed per the manufacturer's recommendations and the Plans.

3.9 MEASUREMENT AND PAYMENT:

- A. Payment will be based upon the unit price in the Bid for each valve constructed within the system and tabulated in the field.

PART 4 TESTING

4.1 GENERAL:

- A. Valves shall be hydrostatically tested and disinfected in new lines as described in the appropriate sections.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This Section covers the work necessary for furnishing fire hydrants and install fire hydrant assemblies in accordance with Sections 5000 WATERLINE INSTALLATION, 5050 VALVES AND METERS, 3800 TRENCHING AND BACKFILL, and the Plans and the Standard Details.
- B. Furnish catalog data and obtain approval of all hydrants before ordering.

1.2 CERTIFICATION:

- A. Furnish certification, properly executed by the manufacture, to the Owner, showing compliance with required Specifications and results of tests performed.

PART 2 PRODUCTS

2.1 HYDRANTS:

- A. The depth of bury shall normally be 3-1/2 to 4-feet. Where conditions require greater depths, extensions shall be attached by the Contractor, prior to installation. The Contractor shall cooperate with the City forces where extensions are attached on the work site and shall maintain excavations and barricades where required.
- B. The following are acceptable hydrants:
 - 1. Mueller Centurion A423
 - 2. M & H Reliant 929T
- C. STYLE
 - 1. AWWA improved, dry barrel, compression type valve, traffic model.
- D. PORTS
 - 1. All hydrants shall be equipped with two (2) 2-1/2 N.S.T. bronze hose ports and one (1) 4-1/2 N.S.T. bronze steamer port. All ports be equipped with cast iron caps.
- E. SHUT-OFF VALVE.
 - 1. Underground type gate valve with "Rich" type valve box with cast iron lid set to grade by six (6) inch cast iron sleeve. Reference Standard Drawing No.511.
- F. DRAIN.
 - 1. Opening(s) at bottom of hydrant, to prevent water in barrel from freezing in cold weather.

G. INLET.

1. Mechanical joint shall be used.
2. Flanged joint shall be approved by Engineer prior to installation.

H. OPERATING STEM.

1. 1-1/2 inch Pentagon, tapered, approximately 3/4 inch wide on flats. Hydrants to open counterclockwise.

I. HYDROSTATIC TESTING.

1. Shall be capable of 150 psi working pressure and 300 psi test pressure.

J. LUBRICATION OF OPERATING ITEM.

1. Shall be provided by an oil or grease reservoir which is sealed from the water chamber. Hydrant design shall be such that water will not be permitted to enter the operating thread cavity.

K. HYDRANT HEIGHT.

1. The center of steamer port shall be minimum of 18 inches and maximum of 24 inches above grade. Extensions, if required, to set a hydrant to proper grade shall be furnished and installed by the Contractor.

L. FACING OF HYDRANTS.

1. The steamer port shall point towards the public right-of-way.

M. OUT-OF-SERVICE HYDRANTS.

1. All new hydrants not yet activated and other hydrants that are out-of-service shall be completely bagged or covered in a manner that really identifies the hydrant as inoperable. These bags will be removed by the Owner when activating the mains.

N. See Standard Detail No.5070-1.

2.2 BASE BLOCK:

- A. Solid precast concrete pier block having nominal dimensions of 16-inches x 16-inches x 8-inches.

2.3 GRAVEL FOR DRAINAGE:

- A. Use ¾-inch minus or 1-inch minus crushed rock free of organic matter, sand, loam, clay, and other small particles that will tend to restrict water flow through the gravel.

2.4 CONCRETE FOR ANCHOR/THRUST BLOCKING:

- A. A mix not leaner than 1 part cement, 2.5-parts sand, 5-parts coarse aggregate and just enough water to make a workable mix. Twenty-eight-day compressive strength shall be a minimum of 3,300 psi. Engineer shall approve quality of materials prior to their use.

2.5 TIE RODS, DUCTILE IRON LUGS, VALVE BOXES, GATE VALVES, AND PIPE;

- A. As shown on the Standard Details, bound herewith, or as specified in the Specifications governing gate valves and ductile iron pipe and fittings, or as directed by the Engineer.

2.6 GALVANIZE PIPE:

- A. Standard weight, galvanized steel, ASTM A120, with galvanized malleable screwed fittings, Federal Specifications WW-P-521.

PART 3 EXECUTION**3.1 GENERAL:**

- A. Construction and installation of hydrants shall conform to provisions of appropriate Sections of AWWA C600, except where otherwise specified. Installation of the hydrant shall conform to the applicable provisions of Section 5000 of these Specifications.

3.2 LOCATION AND POSITION:

- A. Locate as shown on Plans or otherwise as approved by the Engineer.

3.3 EXCAVATION:

- A. Do not carry excavation below subbase grade. Refill over excavated areas with gravel and mechanically compact to provide firm foundation.

3.4 BASE BLOCKS:

- A. Place on firm, level subbase to assure uniform support.

3.5 HYDRANTS:

- A. Place carefully to prevent the base blocking from breaking. After hydrant is in place and connected to the pipeline, place temporary blocks to maintain the hydrant in plumb position during subsequent work.

3.6 ANCHOR BLOCKS:

- A. Bearing surfaces shall rest against undisturbed soil. Bearing area shall be sufficient to prevent movement of pipeline and shall be as specified or directed by the Engineer.

3.7 MEASUREMENT AND PAYMENT:

- A. Payment shall be made at the unit price per each as indicated in the Bid.

PART 4 TESTING

4.1 GENERAL:

- A. Hydrants shall be hydrostatically tested and disinfected in new lines as described in the appropriate sections.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE:

- A. This section includes the materials, equipment, procedures, and requirements to disinfect new and repaired water mains to acceptable levels as provided by the State of Oregon Health Division and City Ordinance.

1.2 BACKGROUND:

- A. Water supply for the City of Woodburn, OR. has **NO** chlorination in its treatment process and no chlorine residual. Therefore, it is critical new facilities be properly installed and disinfected to ensure potable water for public consumption. Contractor's unfamiliar with disinfecting a system under this condition may find it economical to hire an outside contractor, which is competent.

1.3 REFERENCE STANDARDS:

- A. All work will meet the requirements set forth herein and comply with Oregon Administrative Rule (OAR) 333-61-050, and AWWA C651.92, or latest revision.
- B. In the event of conflicts between specifications this is the order of precedence:
1. These specifications
 2. The direction of the Engineer
 3. OAR 333
 4. AWWA C651 (Latest revision)

PART 2 PRODUCTS

2.1 CHLORINE:

- A. Two forms of chlorine disinfection product will be allowed in city water mains:
1. **SODIUM HYPOCHLORITE** - Sodium hypochlorite conforming to ANSI/AWWA B300, in pre-mixed solution, 12.5% available chlorine by weight and 87.5% inert material. Solution shall be contained in approved container and clearly marked by the manufacturer including date solution was prepared, form of the solution, and total weight by volume of chlorine.
 2. **CALCIUM HYPOCHLORITE** - Calcium hypochlorite conforming to ANSI/AWWA B300, in granular form or pre-mixed solution. Solution shall be contained in approved container and clearly marked by the manufacturer including date solution was prepared, form of solution, and total weight by volume of chlorine. Calcium hypochlorite shall be 65% available chlorine by weight.

2.2 PUMPING EQUIPMENT:

- A. Any pump used for injection of disinfection solution shall be clean, operational, well maintained and for the single purpose of injecting chlorine into potable water systems.
- B. The Contractor shall know in advance what the pumping rate of the pump is against an average city system pressure of 55-psi.

2.3 HYDRANT WRENCH:

- A. Fire hydrants shall be operated under the direct supervision of the Engineer. Fire hydrants shall only be opened and closed using standard hydrant wrenches. Pipe wrenches, crescent wrenches and/or other types of wrenches are strictly forbidden.

2.4 IN-LINE CONTROL VALVES:

- A. In-line control valves, connecting directly to city system, shall be operated by the Contractor in the presence of the Engineer with an approved gate valve wrench. Under no circumstances shall Contractor operate valves without an agent of the city present.
- B. Contractor shall ensure that only one valve be opened to or from the city main at a time and that all valves have been returned to the closed position before vacating the site for the day.

2.5 DISINFECTION DOSING AND MIXING RESERVOIR:

- A. Any mixing/dosing reservoir shall be inspected and approved by the Engineer and shall be clean and free of debris that, in the opinion of the Engineer, presents a risk to the disinfection operations.

2.6 WATER SUPPLY:

- A. The Contractor shall make arrangements for providing water for mixing, cleaning, and/or supplying the disinfection operations specifically for use in mixing granulated chlorine in the dosing reservoir.

2.7 SAMPLING TAPS:

- A. Sampling taps shall be in accordance with Standard Detail No.5100-1 of the Standard Specifications. Taps shall be connected to a copper gooseneck service with an approved corporation stops and shut off valves at the sampling points.
- B. Saddles shall not be allowed in tapping operations, unless approved by the Engineer.
- C. Upon acceptance of new water lines sampling taps and assemblies will be removed by City personnel.

PART 3 EXECUTION**3.1 INITIAL FLUSHING:**

- A. Prior to disinfection operations all lines shall be flushed at a minimum of 2.0 fps and a maximum velocity of 10.0 fps. The Engineer will make provisions to quantify the flow rates and times required to completely flush newly installed lines.
- B. Prior to flushing operations the Contractor and the Engineer shall plan how a given system shall be flushed and sequence in which valves will be operated and times required to flush each leg of the system.
- C. During flushing operations fire hydrant valve shall be fully opened and flows shall be controlled, if necessary, by the in-line control valve at connection to existing city main.
- D. Flushing of water mains shall not be allowed after ambient temperature has exceeded 85⁰ F. Should it be imperative to flush on hotter days (above 85⁰ F) it shall be done only with the consent of the Engineer.

3.2 DISINFECTION:

- A. Install an injection point adjacent to the valve connecting the new water main to the existing city water supply on the new main side of the valve.
- B. Disinfection will be accomplished by continuous feed method, defined as follows:
 - 1. Sodium hypochlorite is recommended alternative to calcium hypochlorite though calcium hypochlorite is acceptable.
 - 2. The dosing rate shall be a enough to obtain a minimum of 50 ppm at each sample point. The Engineer will sample the solution to ensure rate has been accomplished. Each sampling point will be checked along the pipeline to ensure that strength is at the minimum of 50 ppm.
 - 3. If the dosing reservoir is of insufficient size as to require mixing of additional batches all subsequent batches shall be mixed at the same dosage rate. A second reservoir shall be set-up adjacent to the primary reservoir so as to ensure a continuous operation.
 - 4. As the chlorinated water flows past fittings, valves, service lines, and hydrants, they shall be thoroughly operated so as to disinfect appurtenances and pipe branches.
 - 5. Minimum contact time shall be 24 hours. The Engineer, in the presence of the Contractor, shall test at each sampling point a minimum of 24 hours after completion of the chlorination operation. Chlorine residual shall be a minimum of 10 ppm. If at this point there is not a residual of 10 ppm in the line at each sampling point the line shall be flushed and steps 1 -5 shall be repeated.

3.3 FINAL FLUSHING:

- A. After required contact time has elapsed and all the requirements of subsection 3.2 have been met the heavily chlorinated water shall be flushed from newly installed lines. Flushing shall continue until the chlorine residual is measured at 0.0 ppm.
- B. Flushing of water mains shall not be allowed after the ambient temperature reaches 85⁰ F without the prior approval of the Engineer.
- C. The environment into which the chlorinated water is to be discharged shall be inspected. If there is any possibility that chlorinated discharge will cause damage to the environment, one of the following procedures, as directed by the Engineer, shall be accomplished.
 - 1. **FLUSH TO EXISTING SANITARY SEWER SYSTEM** - Heavily chlorinated water shall be flushed into the nearest sanitary sewer manhole. The City will provide, to the Contractor, a hose and diffuser, which shall be installed at the direction of the Engineer.
 - 2. **REMOVAL BY TANKER TRUCK** - In the event that a manhole is not within a reasonable distance Contractor shall provide a tanker truck which shall act as a receptacle for flushed chlorinated water then transported to the nearest sanitary sewer and deposited. Tanker shall equipped with a backflow prevention device or an approved air gap shall be employed.
- D. During flushing operations the fire hydrant valve shall be fully opened and the flow shall be controlled by the in-line control valve.

3.4 SAMPLING POINTS:

- A. Sampling taps shall be of the type as described in subsection 2.7 of these specifications.
- B. Sampling taps shall be installed at the end of each length of pipe which extends at least 5 ft. and at other points in the system as instructed by the Engineer to include a minimum of 200 ft. and a maximum of 500 ft. along a continuous section of pipe.

3.5 SERVICE LINES:

- A. Service lines as well as all valves, fire hydrants, sampling points, and etc. shall be chlorinated in accordance with these specifications.

3.6 MEASUREMENT AND PAYMENT:

- A. Payment will be paid per the unit price indicated in the Bid.

PART 4 TESTING**4.1 GENERAL:**

- A. After final flushing a sample set shall be taken by a certified laboratory in accordance with

subsection 4.3 herein.

4.2 SAMPLE SET:

- A. A sample set is the total of individual samples taken on a project at the rate of one for each sample point.
- B. Two (2) consecutive sample sets shall be taken and pass lab test before the line shall be accepted and put in service.

4.3 SCHEDULE OF SAMPLING:

- A. Contractor shall notify the Engineer 48-hours in advance of the time he proposes to schedule sampling operations.
- B. The first sample set shall be take at 48-hours after final flushing is accomplished and the second sample set shall be taken at 72-hours after final flushing.

4.4 TESTING PROCEDURES:

- A. The Contractor shall hire a State of Oregon certified laboratory to come to the site and take a sample set as previously defined.
- B. Samples shall be taken only at approved sample points, no samples will be allowed at fire hydrants or hoses.
- C. Samples shall be placed and transported in, a sterile bottles treated with sodium thiosulfate as required by *Standard Methods for the Examination of Water and Wastewater*.
- D. Samples in a given sample set shall be tested in conformance with approved State of Oregon test methods for microbiological analysis of coliform.
- E. Sample set must show no coliform (total coliform and E.coli) presence at all sample points. The Contractor shall supply an original signed copy or carbon copy of the satisfactory test results to the Engineer.
- F. If testing confirms coliform presence the system shall be completely flushed and re-disinfection repeating the aforementioned procedure.
- G. When samples are satisfactory and all other applicable installation standards are complied with, the City will then assume responsibility for the new main.
- H. Additional testing may be required prior to allowing the line to be placed in service.

END OF SECTION

APPENDIX A – SUBMITTALS CHECK LIST

APPENDIX “A”

Submittals of the following shall be delivered to the Engineer in accordance with Article D(13) of the General Conditions. *NOTE: This list is intended to be a useful guide to the Contractor and not necessarily a definitive list of all items that a submittal may be required on. If requested by the Engineer additional item(s) shall be delivered in the format outlined for review and approval.*

General Conditions:

- Signed Contract
- Signed Notice To Proceed
- Contractor’s personnel’s contact information & 24-hour emergency number
- Contractors Insurance Certificate(s)
- Schedule of work in flow chart format
- List of Subcontractors
- Traffic control plan
- Copies of government permits (Marion County Plumbing, others etc.)

Division 2 – Materials:

- Concrete mix design(s)
- Concrete reinforcement shop drawings
- Concrete placement plan
- Controlled Density Fill (CDF)
- Geotextile fabric(s)
- Paving fabric(s)
- Aggregate lab test per size and source
- Hot mix asphalt job mix formula(s)
- Tack coat material cert
- Pipe and fittings
- Buy American Certification of Materials of Origin

Division 3 – Sitework:

- Staging site Address
- Staking request
- Lawn sprinkler system and equipment
- Dewatering plan
- Bore pit layout
- Erosion/sedimentation control plan
- Bore casing material
- Bore casing isolators and spacers
- Annular flowable grout filler (CDF)
- Debris dumping site location/permit
- Gravity Blocks for retaining wall

Division 4 – Streets

- Paving plan & schedule
- Door Hangers/Notification
- Current truck scale certification
- Crack sealant material specs

APPENDIX "A"

Division 5 – Water

- In line valves
- Fire hydrants
- Blow off assemblies
- Air/vacuum valves
- Restraining & mechanical joints
- Buy American Certification of Materials of Origin

Division 6 – Sanitary Sewers

- Manholes

Division 7 – Storm Sewers

- Manholes
- Catch Basins
- MH invert grout mix design
- Storm Drain Junction Box Traffic Frame & Grate