NOTE TO CONSULTANTS: Edit with Track Changes turned on, any text in this section that appears in bold and italics then turn off the bold and italics for the final approved version. (Remove this Note).

PART 1 - GENERAL

1.01 Description:

A. Include all labor, material, transportation and services to complete installation of the permeable aggregate base and the porous asphalt paving as shown on the drawings for the primary play area.

1. Final sub-grade preparation.
2. Structural soil-bearing fabric.
3. Base course permeable aggregate.
4. Porous Asphalt Paving.

1.02 Related Sections:

Section 31 00 00 - Earthwork
Section 32 11 23 - Mineral Aggregates
Section 32 18 16.16 - Play Area Synthetic Surfacing

1.03 References: This section references the latest revisions of the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

A. The City of Seattle Standard Specifications for Road, Bridge and Municipal Construction (most recent edition).

B. Design Procedure and General Specifications, Asphalt Paving, Asphalt Association of Washington, Inc., (APAAW);

C. American Public Works Association, Washington State Chapter, Standard Specifications for Municipal Public Works Construction, (APWA), latest edition;

D. American Standard Testing Materials, (ASTW);

E. American Association of State Highway and Transportation Officials, (AASHTO).

1.03 Submittals:

A. Submit to the Engineer for approval:

1. Base course permeable aggregate sieve analysis.
2. Base course permeable aggregate infiltration rate.

3. Equipment and procedures to be utilized for the permeable aggregate installation.
4. Porous asphalt aggregate sieve analysis.
5. Porous asphalt composition.
6. Previous experience of the proposed porous asphalt installer with porous asphalt placement.

PART 2 - PRODUCTS

2.01 Structural Soil-Bearing Fabric:

A. Fabric:

1. Material: Fabric shall be 100% Polypropylene, non-woven, needle-punched Engineering Fabric.
2. Physical Properties:

Tensile Strength, (lbs), (ASTM D4632):	100
Elongation (%), (ASTM D4632):	50
Puncture Strength, (lbs), (ASTM D4833):	65
Mullen Burst Strength, (PSI), (ASTM D3786):	225
Trapezoidal Tear, (lbs), (ASTM D4533):	45
Abrasion Res. (% Str. Ret.), (ASTM D4886):	80
Coefficient of Perm., (cm/sec), (ASTM D 4491)	0.22
Flow Rate (Gal/Min./Sq. Ft.), (ASTM D4491)	140

3. Fabric Material shall be: Synthetic Industries #401, as manufactured by Northwest Linings, Ph. (253) 872-0244.
4. Or, approved equal.

2.02 Base Course Permeable Aggregate:

A. The base course permeable aggregate shall be installed below the porous asphalt paving or the top course permeable aggregate as applicable.

B. Aggregates to be open-graded, fractured, friction course. To ensure free drainage, material is clean, with minimal fines the compacted top course permeable aggregate minimum infiltration rate of 40 inches per hour.

C. Base course material to be a minimum of 75% fractured with at least one fractured face by mechanical means on each individual particle larger than ¼". A sand and gravel source is acceptable for this material.
Gradation: Aggregate to meet the following particle size limitations.

Sieve Size	Percent Passing By Weight
1- ¼"	100
1"	90-100
¾"	80-100
½"	50-80
3/8"	40-60

No. 4	20-40
No. 8	15-30
No. 30	10-20
No. 100	2-10
No. 200 (Wet Sieve)	0-3.0
No. 270 (Wet Sieve)	0-1.5

2.03 Porous Asphalt Paving:

A. This mix is intended to have an acceptable balance between adequate and uniform permeability and strength.

B. The amount of liquid asphalt used in the formulation must be precisely controlled to obtain the desired strength while not adversely affecting the permeability.

C. Aggregate:

1. Material to be clean, open graded, fractured.
2. Aggregate to be a minimum of 75% fractured with at least one fractured face by mechanical means of each individual particle larger than ¼".
3. Gradation: Aggregate to meet the following particle size limitations:

Sieve Size	Percent Passing By Weight
5/8"	100
½"	90-100
3/8"	70-90
No. 4	20-40
No. 8	10-20
No. 40	0-8
No. 200	0-3

D. Asphalt Cement:

1. Cement shall be Pg5822 per DOT AASHOTO MP1.
2. Mix shall be between 4.0% and 4.5% asphalt by weight based on weight of total mix.
3. Liquid asphalt shall have a liquid anti-stripping agent additive at a concentration of 0.3% (Chevron Pave Bond Special), or equal.

2.04 Testing:

A. The Engineer will be performing testing of materials delivered to the job site for the purpose of verifying compliance with the contract documents. The Engineer's testing is for this purpose only and not for construction quality control by the Contractor.

B. The Contractor shall coordinate directly with the Engineer's testing firm relative to the delivery schedules of the imported materials. Sampling will be schedules each day deliveries occur.

C. The Contractor shall provide testing and surveillance as required to assure materials and work fully comply with contractor requirements.

D. The Contractor at a price equal to the Owner's contract testing agreement shall pay for Owner's tests that do not meet specifications. The Contractor shall pay directly to the testing organization upon invoice, which has been approved by the Engineer.

PART 3 - EXECUTION

3.01 Sub-grade establishment:

A. No work shall be performed in this section until sub-grade is 100% completed and accepted by the Engineer.

B. Finish sub-grade shall be compacted to a minimum 95% maximum dry density.

C. Sub-grade shall be established to within the tolerance of +0.00' or –0.10' of the design sub-grade elevation.

3.02 Structural Soil-Bearing Fabric Installation:

A. No loose material is allowed on sub-grade prior to placement of structural-bearing fabric. Loose material is to be removed prior to placement.

B. Fabric to be laid on smooth, compacted sub-grade surface between drainage trenches.

C. The Engineer requires approval of sub-grade conditions prior to placement of structural-bearing fabric.

D. Structural-bearing fabric must be flat on stabilized sub-grade for full width.

E. Dimensions to be a minimum width of 12.5' and minimum continuous length of 30 LF.

F. When the length of the fabric is not continuous, the lateral seam shall have a minimum overlap of 24".

G. Fabric shall not be folded or turned up along the edges.

H. The fabric shall be field cut as necessary to meet specified tolerances of distance from drainage trenches.

I. The Fabric shall be placed between trenches. In no instance shall fabric cover trench, lie against aggregate or pea gravel, or extend vertically above sub-grade.

J. Stabilization: Immediately upon laying, the fabric shall be covered with the base aggregate. No loaded trucks shall be permitted to move over fabric-covered surfaces

until a minimum of 4" of aggregate has been placed, except if specifically approved by the Engineer, who will require strict, direct - 100% - control of all vehicle movement on site.

3.03 Equipment Movement:

A. No trucks or equipment will be allowed to drive over the top of the trenches except track-equipped machinery utilized in spreading base aggregate materials, or where a 12" depth base aggregate temporary roadway has been established. Backfill trenches are to be staked and "flagged" 3' above grade for identity.

B. In the event truck traffic is observed or evidenced to cross trenches, the Contractor shall, at their own expense, expose the drainpipe in the area directed for observation by the engineer and repair any damage promptly.

3.04 Aggregate Placement:

A. Moisture Content: Aggregate shall contain 3.5% to 4.0% moisture content to ensure that fines do not migrate and to facilitate proper compaction. The Contractor must ensure that aggregate leaving the source plant meets this requirement and is required to apply water to aggregate on site to attain and maintain this minimum moisture content in stockpile and during all placement operations.

B. Prior to aggregate placement, remove any excess or contaminated backfill from the subsurface drainage trenches.

C. Surface must be free of standing water and sub-grade stabilized with structural fabric in place prior to placement.

D. Materials shall be placed in layers not exceeding 6" bulk and 4 ½" compacted in depth. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation), preferably a self-propelled paving machine.

E. Should there occur, during any stage of the spreading or stockpiling, a separation of the material particles, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent further separation.

3.05 Aggregate Compaction:

A. Each layer shall be compacted to a minimum density of not less than 95% of maximum dry density as determined by ASTM D698 and measured using a nuclear method.

B. Use Static Tandem Drum-type roller of not less than five tons weight.

3.06 Aggregate Tolerances:

A. The Contractor shall utilize a laser plane system for grade control.

B. The surface of the base course permeable aggregate in areas to be paved with porous asphalt shall not deviate from designated compacted grade within the range of –0.50" and 0.00".

C. Upon completion of fine grading, compaction, and Contractor confirmation of conformance with the tolerances, the Contractor shall notify the Engineer and schedule an inspection for approval. Call the **SPR Inspection Request Line @ (206) 684-7034 or by email at parksconstruction.inspection@seattle.gov** to make arrangements for inspection. The Contractor shall have a laser plane system available to the Engineer for the inspections. The Contractor shall not be authorized to pave over the permeable aggregate until it has been inspected and approved by the Architect.

3.07 Porous Asphalt Concrete Paving Installation:

A. Pavement, where possible, shall be laid utilizing self-propelled paving machine of 10' minimum width and laser plane controlled.

B. Plant mix temperature of asphalt shall be a minimum of 260 degrees F.

C. The mix shall be transported to the job site in clean vehicles with smooth dump beds that have been sprayed with a non-petroleum release agent. Limit the time of haul to avoid segregation of the asphalt to the bottom of the truck bed. The mix should be covered during transport to prevent cooling and the formation of lumps.

D. Asphalt shall be placed at a temperature between 230 degrees F. and 250 degrees F.

E. Vertical joints between successive days' work shall be given a light tack coat of emulsified asphalt SS-1, diluted with one part water to one part emulsified asphalt.

F. Surface of the first lift shall be clean and dry before applying the second layer. No tack coat need be applied on the horizontal surface of the first lift.

G. The surface elevation, in the compacted condition, shall not deviate more than ¼" from specified elevations. Trueness measurements to be taken from 10' long straight edge placed in all directions.

H. Upon completion of the paving and Contractor confirmation of conformance with the approval tolerances, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system available to the Architect for the inspections. The Contractor shall not be authorized to place any surfacing over the pavement until the grade has been inspected and approved by the Engineer.

I. The Contractor shall keep the porous asphalt free of contamination from site soil. The Contractor shall take precautions as necessary such as washing truck tires, etc.

3.08 Compaction of Porous Asphalt:

A. Roller to be Tandem Drum-type, Static-type of five ton minimum size. Maximum loading shall be 265 pounds weight per lineal inch of drum.

B. Compaction shall be commenced when the asphalt mix temperature is at a range of 210 degreed F. to 230 degrees F.

C. The first lift shall be rolled to a minimum of one rolling over entire area.

D. The second lift (top leveling course) shall be rolled a minimum of two rollings. The patterns of each successive rolling shall be at right angles or crossing diagonal alignment.

E. Upper surface shall receive a final rolling utilizing a one-ton roller to remove all roller marks and imperfections in the surface.

3.09 Clean Up:

END OF SECTION