SECTION 02621

AGGREGATE BASE AND SUBBASE COURSES

02621.01 GENERAL

A. Description

Aggregate base and subbase courses shall include, but not necessarily be limited to, furnishing and placing one or more courses of aggregate, including additives when required, on a surface prepared in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Subgrade preparation; Section 02610.

2. Chemically treated subgrade; Section 02611.

C. Quality Assurance

1. Materials

All aggregate base and subbase materials will be subject to test by the Engineer to determine the material's compliance with these Specifications. When specific materials tests are called for in the referenced standards and specifications, the Engineer will have the option of requiring that any or all of these tests be performed for materials furnished for a specific project. When testing is required, it will be specified herein or in the "Special Provisions".

2. Field Tests

a. Moisture/Density

1) The County will arrange for all in-place moisture/density testing on the Project. The Engineer shall determine the number of samples to be taken and the frequency of tests required to confirm compliance with the Specifications. The Contractor shall assist the Engineer in obtaining samples and shall provide a smooth surface for conducting moisture/density tests. The Contractor will not be entitled to any claim for additional compensation due to the testing requirements specified herein.

2) The method for testing materials shall be in accordance with the requirements of AASHTO T 180, Method C or D as directed by the Engineer, or as specified herein.

3) At the start of aggregate base and subbase construction, the Contractor shall demonstrate to the Engineer that the compaction

density specified in Section 02260.03 can be attained by the compaction equipment and methods the Contractor intends to use. Once the method and equipment have been approved, no substitutions will be permitted without the Engineer's written approval.

4) Should testing determine that the required density is not being met, or the material is outside the specified moisture range, the Contractor shall, without additional compensation re-excavate, re-work, and/or re-compact the particular layer or section until the required density and moisture are attained.

b. Thickness Tolerances

1) The thickness per course shall be determined by the Engineer at 500 foot intervals by means of test holes dug by the Contractor.

2) When the base course consists of two or more superimposed courses, the total thickness of the composite base courses shall be determined as denoted above.

3) Test holes shall have a minimum diameter of twice the thickness of the layer being placed but shall not exceed 10 inches in diameter. The Contractor shall refill all test holes and corings and compact the material to the required density.

4) In addition to each layer being required to meet a specified depth, the total depth of the completed base or subbase shall equal the summation of the specified thicknesses of all layers. Any deficiency in total compacted depth shall be corrected by loosening the surface, adding material, and finishing in accordance with these Specifications.

5) The completed base or subbase course shall be true to the lines, grades, and cross sections specified. Deviations in excess of 1/2 inch from the cross section and profile grade shown on the Plans shall be corrected. Corrections shall also be made whenever the surface deviates more than 1/2 inch from a 10-foot straightedge applied longitudinally to the finished surface.

6) Portions of the base or subbase course which do not meet the above requirements shall be corrected by being removed and reconstructed, re-rolled, or having the surface reworked as described under Section 02621.03. These corrective measures shall be performed by the Contractor without additional compensation.

3. Laboratory Tests

Laboratory grading tests for graded aggregate for base courses shall be performed in accordance with AASHTO T 27 except that the portion larger than the No. 4 sieve will be tested omitting AASHTO T 11. Field gradation will be determined in accordance with AASHTO T 27 omitting AASHTO T 11.

The percentage of wear shall not exceed 50% when tested in accordance with AASHTO T 96. The soundness loss by five cycles of the sodium sulfate test shall not exceed 12% when tested in accordance with AASHTO T 104. Field gradations will be permitted to go outside of the master band requirements provided that the grading is within the specified tolerances from the approved gradation. When field control sample results deviate from the approved dry grading submitted by the Contractor by more than the specified tolerances, the samples will be sent to an independent laboratory for a complete analysis.

D. Submittals

1. Material Tests

Material test results shall be submitted for all aggregate furnished from other than a licensed commercial operating supplier. The tests shall demonstrate that the material meets all the requirements specified herein.

2. Certificates of Compliance

Certificates of compliance shall be submitted in accordance with the "General Provisions" for the following materials. The certificate shall state that the material meets the requirements specified herein.

a. Aggregates furnished by a licensed commercial operating supplier,

b. All plant mixed materials,

c. Chemicals or additives when used.

02621.02 MATERIALS

A. Materials Furnished by the County

1. The County will not furnish any materials for aggregate base and subbase courses.

2. The Contractor may obtain water from the County's potable water system, for application to the base or subbase courses, in accordance with current County policies and procedures. The Contractor shall contact the Bureau of Utilities, Meter Section, for requirements.

B. Contractor's Options

Calcium chloride may be furnished in either solid or solution form.

C. Detailed Material Requirements

1. Gradation Requirements

TABLE 02621-1

Gradation Requirements for Base and Subbase Materials

Mass Percent Passing

	Maryland		ASTM D 2940**				AASHTO M43	
Sieve Sizes U.S. Standard	BRG Base	BRG S/B	GA Base Master Tol.		GA S/B Master Tol.		No. 1	No. 57
4 inch							100	
3 1/2 inch							90-100	
2 1/2 inch	100	100	-		-		25-60	-
2 inch	-	-	100	-2	100			-
1 1/2 inch	-	-	95-100	±5	90-100	±5	0-15	100
1 inch	85-100	90-100	-		-			95-100
3/4 inch	-	-	70-92	+8	-		0-5	-
1/2 inch	60-100	60-100	-		-			25-60
3/8 inch	-	-	50-70	+8	-			-
No. 4	-	-	35-55	±8	30-60	±10		0-10
No. 8	-	-	-		-			0-5
No. 10	35-75	35-90	-	-	-			-
No. 30	-	-	12-25	±5	-			-
No. 40	20-50	20-55	-		-			-
No. 200	3-20	5-25	0-8	±3	0-12	±5		-

**Job mix tolerances will permit acceptance test results outside the Master range.

2. Graded Aggregate for Base Course

Graded aggregate for base course shall meet the gradation and other requirements of ASTM D 2940 for bases with the following modifications. The liquid limit and plasticity index values shall not be greater than 30 and 6, respectively. Soil fines passing the No. 200 sieve may be tolerated. Where no fines are present, the liquid limit and plasticity index requirements will be waived. The limit for material smaller than the 0.020 mm size and the requirement for sand equivalent will be waived.

3. Coarse Aggregate for Base Course

Coarse aggregate for base course shall meet the gradation requirements of AASHTO M 43, No. 57 as indicated in Table 02621-1.

4. Fine Aggregate for Base Course

Fine aggregate for base course shall be Type II Borrow as specified in Section 02240.02.

5. Bank Run Gravel

   a. General

      The quality and laboratory test methods shall meet the requirements of Section 02621.01 except that the plasticity index shall not exceed 9.

   b. Base Course

      Bank run gravel for base course shall meet the BRG-Base gradation requirements of Table 02621-1.

   c. Subbase Course

      Bank run gravel for subbase course shall meet the gradation requirements of BRG S/B as indicated in Table 02621-1.

6. Graded Aggregate for Subbase Courses

   Graded aggregate for subbase courses shall meet the gradation requirements of ASTM D 2940, GA S/B as indicated in Table 02621-1. In addition, the material shall meet all the other requirements listed in Section 02621.02.

7. Sand Aggregate

   For sand aggregate, the coarse aggregate shall be from 35 to 40% by dry weight of the mixed materials.

8. Calcium Chloride

   a. Solid Calcium Chloride

      Solid calcium chloride shall meet the requirements of AASHTO M 144, Type 1 or Type 2.

   b. Calcium Chloride Solution

      Calcium chloride solution shall contain 30 to 34% solids. The solution shall contain an approved wetting agent in a quantity designated by the Engineer. When analyzed on a dry basis in accordance with AASHTO T 143, the residue shall meet the requirements of AASHTO M 144, Type 2.

9. Water

   Water, when not obtained from the County potable water system, shall be as specified in Section 02611.02.

02621.03 EXECUTION

The subgrade or foundation shall be properly prepared and compacted for at least 500 feet ahead of placing the base or subbase course material.

A. Engineer's Approval

No material shall be deposited upon a frozen subgrade or foundation nor until the subgrade or foundation has been approved by the Engineer.

B. Gravel Base and Subbase Requirements

For gravel base and subbase courses, the Contractor will be permitted to mix or blend materials in order to produce a finished product meeting these Specifications. This manipulation may be accomplished at any place convenient to the Contractor and may include the use of chemical additives designed to alter the physical properties of the material. The cost of any such manipulation or addition of chemical additives shall be included in the bid price for bank run gravel in place. It is to be noted that the point at which this specification is to be met is designated as being in place on the Project.

C. Handling and Transporting Mixtures

Plant mixed materials shall be handled and transported so as to minimize segregation and loss of moisture. On long hauls, or in very hot or windy weather, when appreciable quantities of moisture might be lost by evaporation, the Engineer may require that loads in transit be kept covered with suitable covers. Frequent tests for moisture content will be made at the point of delivery.

D. Spreading Requirements

The material shall be uniformly spread over the surface and against previously formed earth shoulders, berms not less than 2.5 feet wide, or against concrete curbs or gutters. Shoulders or berms shall be built up to the elevation of the top of each uncompacted layer being placed, and the inside edges shall be made as straight and as nearly vertical as practical. Material shall be spread upon the subgrade, foundation, or preceding layer in layers of uniform thickness to give the required compacted depth as shown on the Plans, or established by the Engineer. Material may be deposited on the subgrade, foundation, or preceding layer by any method which will prevent segregation of the coarse and fine particles. String lines or iron pipes, set to indicate the required depth, shall be used for the spreading of each layer of the base or subbase course.

If traffic, including construction equipment, is allowed to use the subgrade, foundation, or preceding layer, it shall be distributed over the entire width of the course in such a manner as to aid in obtaining uniform and thorough compaction.

E. Compaction Requirements

Immediately after spreading, each layer of the material shall be compacted until the required density is obtained. Prior to and during compaction operations, the moisture content of the

material shall be maintained within plus or minus two percentage points of the optimum moisture for the material. The exact moisture content will be specified by the Engineer. In case the material does not meet the minimum moisture content before compacting, water shall be added by the Contractor without additional compensation.

1. Density Requirements

   All courses shall be compacted to a density of not less than 95% of the maximum dry density. In-place density test will be made in accordance with AASHTO T 191 or T 238.

   Should the material fail to meet the specified density, further processing by admixture, reworking, rolling, or other approved methods will be required.

2. Compaction Operations

   Compaction operations, except on superelevated curves, shall begin at the sides of the course, overlap the shoulder or berm at least 1 foot and progress toward the center parallel to the center line of the roadway. Superelevated curve compaction shall begin at the low side of the superelevation and progress toward the high side. The compaction operation shall continue until all compaction marks are eliminated and the course is thoroughly and properly compacted.

3. Corrective Treatments

   The development of a spongy condition during the rolling process may necessitate a delay in the rolling, a lapse of time to permit drying of the foundation or subgrade, or the complete removal and reconstruction of the base or subbase course. The latter treatment may include corrective treatment of the foundation or subgrade. Any or all of these treatments shall be done when and as directed by the Engineer.

   Each layer shall be placed in accordance with the requirements of this section during its construction before receiving any additional layer.

F. Calcium Chloride Addition

Calcium chloride shall be applied to the base or subbase when directed by the Engineer in one of the following manners:

1. Gravel Base

   After each layer of base course has been completed as stipulated herein, for a distance directed by the Engineer, calcium chloride shall be applied uniformly to the surface at the rate of 1 pound per square yard to the width constructed. A second application at the same rate may be applied to the top most layer. If the second application is made, a period of 2 weeks shall elapse between the first and second application. Base surfaces that are dry shall be sprinkled immediately before applying calcium chloride.

2. Graded Aggregate Base

   Calcium chloride shall be added at the mixer at the rate of 7.0 pounds of Type I, Regular Flake, or 5.733 pounds of Type II, Pellets or Concentrated Flakes per ton of finished mixture.

3. Sand Aggregate Base

   When calcium chloride is incorporated at a mixing plant, it shall be at the rate required for graded aggregate base. If added at the job site, calcium chloride shall be placed on the surface in an amount directed by the Engineer. Base surfaces that are dry shall be sprinkled immediately before applying calcium chloride.

G. Correction

If, after the base course has been constructed in accordance with the above requirements, the surface should become distorted or uneven, the Contractor will be required to break same thoroughly by scarifying, mechanically mix, reshape the surface, and compact the base course at his own expense. Any irregularities that may develop in the surface during or after construction shall be corrected to the satisfaction of the Engineer. This base course shall be constructed and completed at least 500 feet in advance of any succeeding surface course.

H. Maintenance Requirements

During construction, and after completion of the base or subbase course(s) and the wearing surface, the entire paved area shall be maintained by the Contractor until surface is treated, paved, or finally accepted. The surface of the course shall be dragged and planed and the wearing surface repaired as often as necessary to maintain it smooth and true to its grade and cross section. Any deficiencies shall be corrected by the Contractor without additional compensation.

1. Moisture and Dust Restrictions

   If the material does not contain sufficient moisture for proper stabilization, or satisfactory maintenance and protection of traffic against formation of dust during this period, the Contractor shall add the necessary moisture and apply calcium chloride to the completed surface as directed by the Engineer.

2. Time Restrictions

   If surface treatment or paving is included in the Contract, the entire roadway shall be maintained under traffic for a period of 90 actual traffic days, or for a lesser period if in the opinion of the Engineer thorough stabilization has been obtained.

02621.04 METHOD OF MEASUREMENT

A. Aggregate Base and Subbase Courses

Measurement for aggregate base and subbase course will be made on the basis of the surface area of the mixed base or subbase course material acceptably placed to the specified compacted depth. Surface area measurements will be based on the nominal width of the base or subbase course specified and actual lengths measured along the surface for each course of the specified thickness.

B. Calcium Chloride

Measurement for the quantity of calcium chloride will be made of the weight applied, in place or at a mixing plant, as directed.

C. Water

Measurement of the volume of water used will not be made as it is incidental to and included in other bid items of work.

02621.05 BASIS OF PAYMENT

A. General

1. Payment will be made at the unit prices bid. The prices bid shall include furnishing all labor, tools, equipment, and materials, including water, necessary to satisfactorily construct and complete the items of work as shown and specified, in strict accordance with the Contract Documents and accepted by the Engineer.

2. Payment will be made for contingent items when ordered by the Engineer. Payment will be made as specified in Sections 02951, 02952, 02953, 02954, 02955, 02956, and 02957.

B. Aggregate Base and Subbase Courses

Payment for aggregate base and subbase courses will be made at the price bid per square yard for the specified base or subbase course constructed.

C. Calcium Chloride

Payment for calcium chloride, in addition to the area payment, will be made at the price bid per ton furnished and incorporated into the base or subbase courses, in accordance with the Contract Documents and accepted by the Engineer.