

ARTICLE 6

AGGREGATE BASE COURSE

6.1 GENERAL

6.1.1 DESCRIPTION

The work under this article shall consist of furnishing, placing and compacting one or more courses of base or sub-base material to provide a firm foundation for subsequent construction. Aggregate base course shall conform with the lines, grades, and cross-sections shown on the plans and shall comply with these specifications.

6.1.2 SUBMITTALS

Aggregate Base Course submittals outlined below are required on all City contracts and any other project within the public right-of-way. All aggregate suppliers furnishing aggregate for placement within any City right-of-way shall furnish to the City once every two years, aggregate gradation analysis for aggregate intended to be used for placement within the right-of-way.

6.2 MATERIAL

6.2.1 BASE AND SUB-BASE MATERIALS

The aggregate for base or sub-base material shall be composed of crushed stone, crushed gravel, or natural gravel which conforms to the quality requirements of AASHTO M 147 (latest revision).

The use of recycled asphalt product (RAP), recycled concrete (RC) not blended or mixed other material, or Fly-Ash blended with Class 6 aggregate base, may not be used unless approved by the City Engineer. At least 50% by weight of the material retained on the No. 4 sieve, and larger, shall have at least one fractured face. This material shall also conform to the following gradation requirements.

Table 6.1. Gradation requirements (Percent Passing Sieve Sizes by weight)

Sieve Size	Sub-base	Base Course	
	Class 1	Class 5	Class 6
4"	-	-	-
3"	-	-	-
2 ½"	100%	-	-
2"	95-100%	-	-
1 ½"	-	100%	-
1"	-	95-100%	-
¾"	-	-	100%
No. 4	30-65%	30-70%	30-65%
No. 8	-	-	25-55%

No. 200 (AASHTO T-11)	3-15%	3-15%	3-12%
Liquid Limit (AASHTO T-89)	35 MAX	30 MAX	30 MAX
Plasticity Index (AASHTO T-90)	6 MAX	6 MAX	6 MAX

The aggregate shall have a Los Angeles Abrasion Test (AASHTO T-96) percentage of wear not exceeding 45% (excluding Class 1). Class 1 material shall have a minimum R value of 69, or a minimum CBR of 40 when tested in accordance with AASHTO T-190 or T-193, respectively. Class 5 & 6 material shall have a minimum R value of 77, or a minimum CBR of 60.

6.2.2 CLASS 1 STRUCTURE BACKFILL

Class 1 structure backfill shall meet the following gradation requirements:

Sieve Size	Mass Percent Passing
	Square Mesh Sieves
50 mm (2 inch)	100
4.75 mm (No. 4)	30-100
300 µm (No. 50)	10-60
75 µm (No. 200)	5-20

In addition, this material shall have a liquid limit not exceeding 35 and a plasticity index of not over six when determined in conformity with AASHTO T 89 and T 90 respectively.

6.2.3 CLASS 2 STRUCTURE BACKFILL

Class 2 structure backfill shall be composed of suitable materials developed on the project. To be suitable for use under this classification, backfill shall be free of frozen lumps, wood, or other organic material. If the material contains rock fragments that, in the opinion of the Engineer, will be injurious to the structure, the native material shall not be used for backfilling and the Contractor shall furnish Class 1 structure backfill material at the contract unit price. If contract unit price does not exist for Class 1 structure backfill, it will be paid for in accordance with subsection 104.03.

6.2.4 CLASS 3 STRUCTURE BACKFILL

Class 3 structure backfill or squeegee shall be a sandy gravel and meet the following gradation:

Sieve Size	Mass Percent Passing
	Square Mesh Sieves
9.5 mm (3/8 inch)	90-100
4.75 mm (No. 4)	45-80
0.075 mm (No. 200)	5-12

6.3 CONSTRUCTION REQUIREMENTS

6.3.1 SUBGRADE PREPARATION

Care shall be exercised in the hauling and placing of base/subgrade course materials to avoid segregation of the coarse and fine aggregates and to avoid contamination of the base/subgrade course materials with undesirable materials. Any ruts, holes, defects or soft yielding areas which occur in the subgrade for any cause shall be corrected and compacted to the required density and stability before an aggregate base course is placed. These repairs shall be made at the expense of the contractor. Subsequent base course layers shall be placed within 24 hours of the approval of the subgrade or moisture and density shall be reconfirmed at the expense of the Contractor.

6.3.2 PLACING AND MOISTURE CONDITIONING

The aggregate shall be uniformly deposited on the approved subgrade by means of the hauling vehicle with or without spreading devices. Aggregate shall be distributed over the surface to the depth specified on the plans or as established by the City Engineer. The maximum loose lift thickness shall be no more than 8".

Care shall be exercised in the hauling and placing of the course materials to avoid segregation of the coarse and fine aggregates and to avoid contamination of the course materials with undesirable materials.

After the base course materials have been deposited, the course shall be thoroughly blade-mixed to the full depth of the layer by alternately blading the entire layer to the center and back to the edges of the road. It shall then be spread and finished to the required cross section by means of a self-propelled tired motor grader.

Water shall be applied prior to and during all blading and processing operations to moisten the material sufficiently to prevent segregation of the fine and coarse particles. Water shall be applied during the compaction in sufficient amounts to assist in compaction and prevent raveling.

The contractor shall be responsible for ensuring that their hauling operations do not cause excessive track out of dirt/mud onto paved streets adjacent to the work zone. All tracked out materials shall be promptly removed by the contractor at their sole expense. At a minimum, a sweeper operation shall be performed daily.

6.3.3 COMPACTION

Compaction shall immediately follow the spreading operation. If the compacted depth of the course exceeds 6", the course shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6".

Each layer shall be compacted to a density of not less than 95% of the maximum density in accordance with AASHTO T-180. Field, in-place density tests will be in accordance with Table 6.2. The finished surface of each layer shall have a uniform texture. Water shall be

uniformly applied over the materials during compaction in the quantity necessary for compaction. Moisture conditions shall be within 1% of optimum moisture content. It is to be expected that a loss of density in the upper portions of the material may occur due to a lapse in time, elements, or other reasons. Moisture conditioning and recompaction to the specified density will be required prior to placement of any subsequent layer and no additional compensation will be allowed for such work. Testing shall be completed within 24 hours of the placement of the next course. Base shall be retested if the next course is delayed beyond 24 hours or if exposed to precipitation.

6.3.4 PROOF ROLL

Prior to placing any base material, the subgrade shall be proof rolled in accordance with ARTICLE 7 – EARTHWORK Section 7.3.15.1. Any unsuitable areas shall be corrected to the satisfaction of the City Engineer.

Prior to placing any pavement, the base shall be proof rolled. Any unsuitable areas shall be corrected to the satisfaction of the City Engineer with density testing provided by the contractor. Following placement of material, if environmental conditions warrant, the material shall be retested for moisture/density and proof rolling at the contractor's expense.

6.3.5 SURFACE AND THICKNESS TOLERANCES

The surface of the prepared base course material shall be free from depressions exceeding 1/4" in 10' when measured with a straight edge. Spot checks should not vary more than 1/2" up or down from the calculated elevation (plan grade). The surface of the base of the sub-base course shall be smooth and true to the established crown, grade and thickness. Any areas not within these tolerances shall be reworked until compliance is achieved. The required compacted thickness shall be as specified on the construction drawings.

6.3.6 QUALITY CONTROL

All samples and tests described herein shall be made in accordance with approved ASTM/AASHTO procedures. The owner/developer shall provide for all testing laboratory services in connection with tests verifying conformance of proposed materials with project requirements. The owner/developer shall also provide for testing laboratory services in connection with tests on materials after incorporation into the project.

Additional tests may be required at the direction of the Engineer. If additional tests are required, the financial burden will be borne by the contractor/developer if the testing results fail to meet minimum city specifications. If the testing results meet or exceed the City specifications the additional testing costs will be paid for by the requesting entity.

Prior to installation of base or sub-base course materials, the owner/developer shall provide the City Engineer with a copy of the R-value test results, gradation analysis, Atterberg Limits (Liquid Limit /Plasticity Index), and moisture/density curve for the proposed base or sub-base course materials. Laboratory testing should be completed on samples taken from the plant site or proposed borrow.

Testing should be completed per the below schedule of testing. If, in the opinion of the City Engineer, the material being used on the jobsite is not at any time in conformance with approved laboratory mix designs or test reports, conformance tests shall be run. If this material does not meet the specifications, testing shall be paid for and the problem remedied at the expense of the Contractor.

During placement of aggregate base and/or sub-base, testing shall be completed on a regular basis to verify specification compliance. Required laboratory testing shall be completed on samples secured from the jobsite.

Table 6.2. Schedule of testing

Testing	Frequency
Gradation Analysis	1/Project Site or material change
Atterberg Limits (LL & PI)	1/Project Site or material change
Moisture/Density Curve	1/Project Site or material change
In-place density tests (AASHTO T-191, 205, 238) Includes thickness measurement	1/200 L.F. per lane

6.4 METHOD OF MEASUREMENT

Aggregate base course construction described herein will be measured as a separate pay item. Measurement shall be by the ton as evidenced by weight tickets for each truckload or fraction thereof.

6.5 BASIS OF PAYMENT

Base course material, when directed by the City Engineer, used as replacement for unsuitable material will be paid as “Subgrade Stabilization” and shall include all costs associated with the excavation, removal and disposal of unsuitable materials and all costs associated with furnishing, placing and compacting the aggregate base material. This payment shall be full compensation for all materials, tools, equipment, and labor necessary to complete the work under this section in accordance with the plans and specifications.