ITEM 73

AGGREGATES

73.01 FINE AGGREGATE FOR CONCRETE

Fine aggregate for Portland Cement Concrete shall conform to the requirements of AASHTO, "Standard Specification for Fine Aggregate for Portland Cement Concrete," Serial Designation M 6, with the following exceptions and added stipulations:

(a) The option regarding alternate freeze-thaw tests for soundness will not be exercised.

(b) The fine aggregate shall be washed in the processing operations.

(c) Fine aggregate manufactured from limestone or dolomite shall be processed from material which has been scalped to remove quarry fines. The material from which the fine aggregate is processed shall have a percentage of wear, Los Angeles Test, of not more than forty.

(d) The amount of deleterious substances shall not exceed the following limits:

	Maximum Permissible Limits, By Weight
1. Clay Lumps	0.5%
2. Coal and Lignite	0.5%
3. Material Passing the No. 200 Sieve	3.0%
4. Other Deleterious Substances (such as Shale, Alkali, Mica, Coated Grains, Soft and Flaky Particles)	3.0%

(e) Fine aggregate shall be well graded from coarse to fine and, when tested by means of laboratory sieves, shall conform to the following requirements:

Sieve Size	Total Percent Passing, By Weight
3/8 inch	100
No. 4	95-100
No. 16	60-90
No. 100	10-30
No. 200	0-3

73.02 FINE AGGREGATE FOR MORTAR

Mortar sand shall conform to the requirements of AASHTO, "Standard Specification for Aggregate for Masonry Mortar," Serial Designation M 45. Sand for mortar shall be uniformly graded from coarse to fine within the following limits:

Sieve Size	Total Percent Passing, By Weight
No. 8	100
No. 50	15-40
No. 100	0-10
No. 200	0-5

73.03 COARSE AGGREGATE FOR CONCRETE

Coarse aggregate for any type or class of Portland Cement shall consist of crushed stone or crushed or uncrushed gravel, unless otherwise specified.

Coarse aggregate for Portland Cement Concrete base and pavement shall be furnished in two sizes: Size No. 4 and Size No. 67, as shown in Item 73.19. The two sizes shall be manufactured, within the specified limits, so as to produce Size No. 467, Item 73.19, when combined in the proper proportions at the batching plant.

Coarse aggregate for structural concrete shall be Size No. 57, Item 73.19.

Coarse aggregate for pre-stressed and precast concrete shall be Size No. 57 or Size No. 67, Item 73.19, as may be specified or directed.

Coarse aggregate for concrete curbing placed by machine-extrusion methods shall be Size No. 7 or 78, Item 73.19.

The coarse aggregates shall otherwise conform to the requirements of AASHTO, "Interim Specification for Coarse Aggregate for Portland Cement Concrete," Serial Designation M 80, with the following exceptions and added stipulations:

(a) Deleterious Substances

The amount of deleterious substances shall not exceed the following limits:

		Maximum Percent, By Weight
1.	Soft or non-durable fragments (fragments which are structurally weak such as shale, soft sandstone, limonite concretions, gypsum, weathered schist or cemented gravel)	3.0
2.	Coal and lignite	1.0
3.	Clay lumps	0.25
4.	Material passing the No. 200 sieve	0.75
5.	Thin or elongated pieces (length greater than 5 times average thickness)	10.0
6.	Other local deleterious substances	1.0

The sum of the percentages of Items No. 1, 2, 3, 4, and 6 shall not exceed 5.0.

(b) When the coarse aggregate is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than nine percent. Coarse aggregate failing to meet the requirement for soundness may be accepted, provided it can be shown by evidence satisfactory to the Engineer that concrete of comparable proportions made from the same source has been exposed to weathering under conditions similar to those occurring at the site of the structure for a period of at least ten years without appreciable disintegration.

The sum of the percentage of Items No. 1, 2, 3, 4, and 6 for soundness will not apply to (b) above.

73.04 AGGREGATE FOR PENETRATION MACADAM BASE

Aggregate for penetration macadam base shall be crushed stone or crushed slag meeting the quality requirements of AASHTO, "Standard Specification for Crushed Stone and Crushed Slag for Bituminous Concrete Surface Coarse," Serial Designation M 79, except that the sodium sulfate soundness loss shall not exceed nine percent and the percentage of wear, Los Angles Test, shall not exceed fifty.

The gradation of the aggregate shall meet the requirements for the following sizes in Item 73.19:

Coarse	Size No. 24
Key or Choker	Size No. 6

73.05 AGGREGATE FOR MINERAL AGGREGATE BASE AND SURFACE COURSES

Aggregate for Mineral Aggregate Base and Surface Course shall be crushed stone, crushed slag, crushed or uncrushed gravel, or crushed or uncrushed chert, together with such material aas manufactured sand or other fine materials naturally contained, or added thereto as needed to conform with these Specifications.

The aggregate shall be of two classes: Class A and Class B.

(a) Class A aggregate for mineral aggregate base and surface courses shall consist of hard durable particles or fragments of stone, slag, gravel, or chert, and other finely divided mineral matter. Individual materials shall meet the requirements specified below:

1. Crushed stone shall be free from silt and clay. The coarse aggregate portion of the stone shall have a percentage of wear of not more than fifty, and when subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall not exceed fifteen.

2. Crushed slag shall be free of silt and clay and shall meet the quality requirements of crushed stone. It shall be reasonably uniform in density and shall have a dry-rodded weight of at least seventy pounds per cubic foot.

3. Crushed gravel and crushed chert shall be screened, and all oversize material shall be crushed and fed uniformly back over the screen. The coarse aggregate portion (retained on tthe No. 4 sieve) shall have a percentage of wear of not more than thirty. The portion of the material passing the No. 40 sieve shall be non-plastic or shall have a liquid limit of not more than twenty-five and a plasticity index of not more than six.

   If a fine aggregate, coarse aggregate or binder, in addition to that present in the base material, is necessary in order to meet the gradation requirements, or for satisfactory bonding of the material, it shall be uniformly blended with the base coarse material at the mixing plant by a mechanical feeder to maintain a uniform flow on the belt to the mixer. Blending of materials on the stockpiles or in the pits by bulldozer, clamshell, dragline or similar equipment will not be permitted.

   The composite gradation of Class A aggregate shall be the grading specified.

(b) Class B aggregate for mineral aggregate base shall consist of crushed or uncrushed gravel, crushed or uncrushed chert, crushed stone or crushed slag, and other finely divided particles. The quality of Class B aggregate shall be the same as the quality requirements for Class A aggregate with the following exceptions:

Gravel or chert Class B aggregate shall be screened, and oversize materials may be wasted or crushed and returned over the screen and uniformly blended with the other material. The coarse aggregate portion (retained on the No. 2 sieve) shall have a percentage of wear of not more than forty. Material having a clay content greater than twelve percent, as determined by hydrometer analysis, will not be permitted. Material having a clay content not exceeding twelve percent will be acceptable, provided a plasticity index-fines product does not exceed 3 when calculated by the following formula:

Per Cent Passing No. 40 Sieve x P.I. of Minus 40 Material 100

If an excess of binder occurs, crushed stone, crushed slag, gravel, chert, and sand, or other approved granular materials shall be uniformly incorporated in such proportions, not to exceed twenty percent of the total mix, as the Engineer directs.

If the quantity of binder is insufficient to bond the base or surface course properly, additional binder of approved quality, in an amount not to exceed fifteen percent of the total mix, shall be uniformly incorporated as directed by the Engineer.

The use of material requiring the addition of coarse aggregate or binder in excess of the above limits will not be permitted unless otherwise specified on the Plans or in the Contract.

Blending of additional material, if required, may be performed either at the screening or mixing plant or on the road. If blending is done at the plant, mechanical feeders which will maintain a uniform flow of the materials on the conveyor belt to the mixer or screening plant shall be employed. If blending is done on the road, the two or more materials shall be spread in uniform layers and blended by means of a mechanical mixer. Blending of materials on the stockpile or in the pit by means of a bulldozer, clamshell, or similar equipment will not be permitted.

When combinations of materials for Class B aggregate for mineral aggregate base and surface courses, such as creek gravel and chert, bank gravel and chert, crushed stone and chert, or crushed slag and chert, are permitted, they will be designated on the Plans or in the Contract and the pertinent requirements of this Specification for quality, blending of materials, and gradings shall apply.

The composite gradation of Class B aggregate shall be the grading specified on the Plans or in the Contract.

GRADING TABLE FOR CLASS A AND CLASS B AGGREGATE FOR MINERAL AGGREGATE BASE AND SURFACE COURSES

Sieve Size	Class A	Class B	Class C1	Class C2	Class D and E	Class F
2"	100					
1 1/2"	75-100	100				
1"			100			
3/4"	45-70	65-90	85-100	100		
1/2"					100	
3/8"	30-55		55-80	60-90	85-100	100
No. 4	20-40	30-55	35-60	40-65	55-82	85-100
No. 8	10-30	20-45			38-62	75-95
No. 30	5-20	8-25	7-22	7-25	18-42	35-70
No. 50						5-20
No. 100		1-12	1-12	1-12	3-12	5-20
No. 200	0-8	0-7			0-8	2-10

73.06 AGGREGATE FOR PLANT MIX BASE AND LEVELING COURSES (HOT MIX)

Aggregate for plant mix base and leveling courses shall consist of coarse aggregate, fine aggregate, and mineral filler when required.

Prior to the approval of the job-mix formula and at least ten working days prior to the beginning of this construction, a sample of each material to be used in the mix shall be submitted to the Engineer for laboratory tests and evaluation. If at any time the sources of materials are changed, samples of the new materials shall be submitted for laboratory tests.

(a) Coarse Aggregate

Coarse aggregate (aggregate retained on the No. 4 sieve) shall be crushed stone, crushed slag, or crushed gravel, or combinations of these materials, except as hereinafter specified. It shall conform to the quality requirements of AASHTO, "Standard Specification for Crushed Stone, Crushed Slag, and Crushed Gravel for Open-Graded Bituminous Road Mix Surface Course," Serial Designation M 63. At least fifty percent of the gravel retained on the No. 4 sieve shall have at least one fractured face. Crushed slag coarse aggregate shall contain no more than twenty percent, by weight, of glass particles.

(b) Fine Aggregate

Fine aggregate shall consist of natural sand; sand manufactured from stone, gravel, or slag; or combination thereof. It shall consist of hard, tough grains free from injurious amounts of deleterious substances, and when subjected to five cycles of the sodium sulfate soundness test, it shall have a weighted loss of not more than fifteen percent. In natural sand, the percentage of material finer than 200 mesh shall not exceed five percent.

Fine aggregate in Gradings A, B, C1 and C2 shall consist of crushed stone or crushed slag only and shall be stored separately from the coarse aggregate.

(c) The Combined Grading

The gradations of the coarse and fine fractions of aggregate shall be such that when combined in proper proportions, the resultant mixture will meet one of the following gradings, as specified.

In addition, the combination of materials for Grading B and C shall be such that when combined with the required amount of bitumen, the resultant mixture shall have a stability of not less than 1,000 pounds when tested in accordance with ASTHMA, "Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus," Serial Designation D 1559. The compactive effort shall be 75 blows of the hammer on each end of the specimen.

HOT PLANT MIX BASE AND LEVELING COURSE
MIXTURE DESIGNATION
MASTER RANGE OF GRADATIONS

	Total Percent Passing, By Weight			
Sieve Size	Grading A (Base)	Grading B (Base)	Grading C-1 (Leveling)	Grading C-2 (Leveling)
2"	100			
1 1/2"	75-100	100		
1"			100	
3/4"	45-70	65-90	85-100	100
3/8"	30-55		55-80	60-90
No. 4	20-40	30-55	35-60	40-65
No. 8	10-30	20-45		
No. 30	5-20	8-25	7-22	7-25
No. 100		1-12	1-12	1-12
No. 200	0-8	0-7		

73.07 AGGREGATE FOR ASPHALTIC CONCRETE SURFACE COURSES (HOT MIX)

Aggregate for asphaltic concrete surface courses shall consist of a combination of coarse and fine aggregate, and mineral filler when required or specified. Prior to the approval of the job-mix formula and at least ten working days prior to the beginning of this construction, a sample of each material to be used in the mix shall be submitted to the Engineer for laboratory design and determination of the optimum asphalt content. If at any time the sources of materials are changed, samples of the new materials shall be submitted for laboratory tests.

(a) Coarse Aggregate

The coarse aggregate (aggregate retained on the No. 4 sieve) shall consist of crushed stone, crushed slag, or crushed gravel. Only one kind shall be used on any project except by permission of the Engineer. The coarse aggregate shall meet the quality requirements of AASHTO, "Standard Specification for Crushed Stone, Crushed Slag and Crushed Gravel for Dense Graded Bituminous Road and Plant-Mix Surface Course," Serial Designation M 62, with the following exceptions and additions:

The sodium sulfate soundness loss shall not exceed twelve percent.

Crushed gravel shall consist of siliceous particles, processed from washed material, of which a minimum of eighty-five percent, by count, of the material retained on the No. 4 sieve shall have one or more fractured faces, fractured for the approximate average diameter or thickness of the particles. The addition of pea gravel or uncrushed particles will not be permitted.

Crushed slag coarse aggregate shall contain not more than twenty percent, by weight, of glassy particles.

(b) Fine Aggregate

The fine aggregate (passing the No. 4 sieve) shall consist of natural sand, or of sand prepared from stone, slag or combinations thereof. It shall consist of hard, tough grains free from injurious amounts of clay, loam, or other deleterious substances. The fine aggregate, when subjected to five cycles of the Sodium Sulfate Soundness Test, shall have a weighted loss of not more than 15 percent.

In addition to the above, the following requirements shall also apply.

Natural sand shall be washed, except that an unwashed filler sand may be used in an amount not to exceed fifteen percent by weight of the total fine aggregate (-4 Material).

If a filler sand is used, it shall be free of clay lumps and other deleterious substances. The natural sand shall be so graded that no more than five percent will be retained on the No. 4 sieve.

Fine aggregate consisting of natural sand, including filler sand or sand manufactured from crushed gravel, or any combination of these materials will be tested in accordance with AASHTO, "Standard Method of Test for Amount of Material Finer than 0.075 mm Sieve in Aggregate," Serial Designation T 11, and the loss on the 200 mesh sieve shall not exceed four percent by weight.

Agricultural limestone, when used as a portion of the fine aggregate, shall be manufactured from sound, durable stone and shall be crushed so that at least eighty-five percent will pass the No. 8 mesh sieve and at least fifty percent will pass the No. 30 mesh sieve.

(c) The Combined Grading

The several aggregate fractions shall be sized, graded, and combined in such proportions that the resulting composite blend will meet one of the following grading requirements, as specified, together with the stipulations pertaining to the constituents of the blend hereinafter specified.

ASPHALTIC CONCRETE SURFACE COURSE
MIXTURE DESIGNATION
MASTER RANGE OF GRADATIONS

	Total Percent Passing, By Weight		
Grading Sieve Size	D	E	F
3/4"	100		
5/8		100	
1/2"	95-100	95-100	
3/8”	80-98	80-98	100
No. 4	53-80	53-80	85-100
No. 8	36-60	36-60	75-95
No. 30	16-40	16-40	35-70
No. 50			20-50
No. 100	3-12	3-14	5-20
No. 200	2-8	3-10	2-10

Grading D

The mineral aggregate shall be composed of crushed gravel, crushed granite, crushed slag, natural sand, granite screenings, slag screenings, or a combination of the proper sizes of these materials. The use of carbonate rocks such as limestone and dolomite or other aggregates tending to polish under traffic will not be permitted in the coarse aggregate and will be permitted only to the extent specified herein in the fine aggregate.

When the combined mineral aggregate includes crushed gravel or natural sand, agricultural limestone in an amount of not less than ten percent nor more than twenty percent by weight of the mineral aggregate shall be used. The addition of agricultural limestone, within the range specified above, will also be required in crushed slag and crushed granite aggregate when needed to meet the specified design criteria or when directed by the Engineer.

In addition to the other requirements of these Specifications, the composition of the mineral aggregate shall be such that when combined with the required amount of bitumen, the resultant mixture will comply with the following design criteria as determined by the Marshall Method of Test Criteria.

Stability, min.	1,000 lbs.
Void Content	4-9 percent
Flow	8-16

If these values cannot be obtained with the aggregate submitted for laboratory design or if, in the opinion of the City, the quality of the mix can be improved, the addition of limestone screenings* in an amount not to exceed twenty-five (25) percent by weight of the mineral aggregate and/or the addition of mineral filler, meeting the requirements of Item 73.13, in an amount not to exceed five percent of the mineral aggregate, will be required. If the mixture still does not meet the design criteria, another source of aggregate will be necessary.

* The gradation of the limestone screenings for use in Grading "D" shall have at least 95 percent passing the No. 4 screen and not less than ten percent passing the 100 mesh sieve.

Grading E

When Grading "E" is to be used as a surface for traffic lanes, the mineral aggregate shall be composed of not less than 50 percent nor more than 55 percent crushed limestone and not more than 50 percent nor less than 45 percent natural sand, slag sand, sand manufactured from gravel, or any combination of these materials, except as herein specified.

The requested sand percentage on the job mix formula shall be in the range of 45 to 50 percent. However, if needed to meet or improve the specified design criteria, the limestone and sand percentage may be altered by the numerical value of +5 percent from the percentages shown by the Contractor on the original job mix formula request. In the event the limestone and sand percentages are altered from those shown on the original job mix formula, the Contractor shall request a new job mix formula using the aggregate percentages shown on the design.

When Grading "E" is used for surfacing of shoulders or other non-traffic lane construction, the mineral aggregate may be composed entirely or in part of limestone, but in no case shall the mineral aggregate for this construction consist of less than 50 percent.

Limestone: When this mix is used for asphalt curb construction, it shall conform to the combined gradation specified under (c) except that the requirements for material passing the 200 mesh sieve shall be 5 to 10 percent.

In addition to other requirements, the composition of the mineral aggregate shall be such that when combined with the required amount of bitumen, the mixture will comply with the Marshal Method of Test Criteria results as follows:

Stability, min.	1,000 lbs.
Void Content	4-9 percent
Flow	8-16

In the event that the above design criteria may be improved with the addition of mineral filler to the aggregate submitted to the laboratory for design, the addition of mineral filler meeting the requirements of Item 73.13 in an amount not to exceed 5 percent by weight of the mineral aggregate will be required. If mineral filler is added to a mixture, it will be considered as a part of the limestone percentage.

If the design criteria above cannot be obtained with the aggregate submitted to the laboratory for design, another source of aggregate will be necessary.

Grading F

The mineral aggregate shall be composed of not less than seventy-five percent nor more than eighty-five percent of either natural sand, slag sand, sand manufactured from siliceous material or any combination of these materials, and not less than fifteen percent more than twenty-five percent of stone screenings meeting the gradation requirements of Size No. 10, Item 73.19.

In addition to the other requirements of these Specifications, the composition of the mineral aggregate shall be such that when combined with the required amount of bitumen, the resultant mixture shall have a minimum stability of 800 pounds when tested in accordance with the Hubbard-Field Method of mix design. The method of test shall conform to AASHTO, "Standard Method of Sampling Bituminous Paving Mixtures," Serial Designation T 168, except for the following modifications:

(1) The specimen shall be consolidated by applying a pressure of 5096 psi, which corresponds to a total load of 16,000 pounds for a specimen two inches in diameter. This pressure shall be maintained for five minutes and then released.

(2) The test specimens, testing mold, and plunger shall be brought to the desired temperature of test by storing in a water bath for one hour with the temperature of the water maintained by (140+ 2°F.) or (60+ 1°C.) during the entire storage period.

If the minimum stability cannot be obtained, the addition of mineral filler meeting the requirements of Item 73.13 in an amount not to exceed five percent of the mineral aggregate will be permitted in order to obtain the minimum stability. If the mixture still lacks stability, another source of aggregate will be necessary. When mineral filler is added, it will be considered as part of the stone screening percentage.

73.08 AGGREGATE FOR HOT BITUMINOUS SEAL COAT (SPLIT APPLICATION)

Aggregate for hot bituminous seal coat (split application) shall consist of crushed stone, crushed slag or crushed gravel meeting the quality requirements of AASHTO, "Standard Specification for Crushed Stone, Crushed Slag and Crushed Gravel for Open-Graded Bituminous Road-Mix Surface Course Serial Designation M 63, except that the sodium sulfate soundness loss shall not exceed nine percent. Crushed slag aggregate retained on the No. 4 sieve shall contain not more than twenty percent, by weight, of glassy particles.

The amount of material finer than 200 mesh shall not exceed 1.0 percent. If all material finer than the 200 mesh sieve consists of the dust of fracture, essentially free from clay or shale, the percentage may be increased to 1.5.

At the option of the Engineer, the aggregate may be tested for bituminous film retention. When tested in accordance with AASHTO, "Standard Method of Test for Coating and Stripping of Bitumen-Aggregate Mixtures," Serial Designation T 182, the aggregate shall have a bituminous film retention in excess of ninety-five percent.

Aggregates which are tested and do not meet the film retention requirement may be approved provided a satisfactory chemical additive is used.

Aggregate used in the mat shall be Size No. 6. Aggregate used in the seal shall be Size No. 7, Item 73.19.

73.09 AGGREGATE FOR HOT BITUMINOUS SEAL COAT

Aggregate for hot bituminous seal coat shall be crushed stone, crushed gravel, or crushed slag meeting the requirements specified in Item 73.08. The gradation requirement shall be those shown for size No. 7, Item 73.19.

73.10 AGGREGATE FOR DOUBLE BITUMINOUS SURFACE TREATMENT

Aggregate for double bituminous surface treatment shall conform to the requirements of Item 73.08. Aggregate used in the mat shall be Size No. 6. Aggregate used in the seal shall be Size No. 7, Item 73.19.

73.11 AGGREGATE FOR AGGREGATE-CEMENT BASE COURSE

Aggregate for aggregate-cement base course shall consist of coarse aggregate composed of sound, tough, durable fragments of crushed stone, crushed slag, crushed or uncrushed gravel, or crushed or uncrushed chert; fine aggregate composed of natural or manufactured sand; and silt-clay or other finely divided mineral matter.

The aggregate shall be of such gradation that all will pass a 1 1/2 inch sieve, not more than seventy-five percent will pass the No. 4 sieve, and not less than five nor more than fifteen percent will pass the No. 200 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than thirty-five, and a plasticity index not greater than ten.

The combined total of shale, organic material, or other unwanted substances shall not exceed five percent by weight.

73.12 AGGREGATE FOR SUBGRADE INSULATION COURSE

Aggregate for Subgrade Insulation Course shall consist of sand-gravel, crushed stone, crushed or granulated slag, or combinations of these materials.

That portion of the mineral passing the No. 40 sieve shall have a liquid limit not greater than twenty-five, and a plasticity index not greater than six.

The materials shall meet the following gradation requirements:

Sieve Size	Total Percent Passing By Weight
1 1/2"	100
3/4 "	95-100
No. 8	30-100
No. 200	0-100

73.13 MINERAL FILLER

Mineral filler shall meet the requirements of AASHTO "Mineral Filler for Bituminous Paving Mixture," Serial Designation M 17.

73.14 AGGREGATE FOR UNDERDRAINS

(a) Aggregate for under-drains shall be crushed stone, crushed slag, or washed gravel meeting the quality requirements of AASHTO, "Standard Specification for Crushed Stone, Crushed Slag, and Crushed Gravel for Open Graded Bituminous Road-Mix Surface Course," Serial Designation M 63, and the grading requirements for size 6, 7, or 8, Item 73.19.

(b) Natural sand shall be washed and shall meet the quality requirements of AASHTO, "Standard Specification for Fine Aggregate for Bituminous Paving Mixture," Serial Designation M 29. It shall have a gradation meeting the requirements for Size 9, Item 72.19, or the gradation specified in Item 73.01 (e) except that the percent passing the No. 50 sieve shall be 0-30.

73.15 AGGREGATE FOR SAND-ASPHALT SURFACE COURSE

Aggregate for sand-asphalt surface course shall consist of natural sand and/or crushed siliceous material meeting the quality requirements of ASTM, "Standard Specification for Fine Aggregate for Bituminous Paving Mixtures," Serial Designation D 1073.

In the natural sand, the percentage of material finer than the 200 mesh shall not exceed five. The natural sand or combination of these materials shall meet the following requirements for gradation:

Sieve Size	Total Percent Passing By Weight
No. 4	100
No. 8	95-100
No. 30	50-80
No. 50	30-60
No. 100	8-65
No. 200	2-10

In addition to the above requirements, the sand-asphalt mixture shall have a minimum stability of 400 pounds when tested in accordance with AASHTO, "Standard Method of Sampling Bituminous Paving Mixtures," Serial Designation T 168. If this value cannot be obtained, the addition of mineral filler, meeting the requirements of Item 73.13 in an amount not to exceed five percent of the mineral aggregate, will be permitted in order to obtain this minimum stability. If the mixture still lacks stability, another source of aggregate will be necessary.

73.16 LIGHTWEIGHT AGGREGATES FOR STRUCTURAL CONCRETE

Lightweight aggregate for structural concrete shall conform to the requirements of ASTM, "Standard Specification for Lightweight Aggregates for Structural Concrete," Serial Designation C 330, sizes as specified.

73.17 STOCKPILING AGGREGATES

Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground shall be firm and smooth and well drained. A cover of at least three inches of aggregate shall be maintained in order to avoid the inclusion of soil or foreign material. The stockpiles shall be built in layers not exceeding four feet in height, and each layer shall be completely in place before the layer is started so as to prevent segregation. The material shall be deposited in such manner as to prevent coning, except in the case of aggregate composed essentially of material finer than the No. 4 sieve and base material.

Dumping, casting or pushing over sides of stockpiles will be prohibited, except in the case of aggregate for base material and fine aggregate materials.

Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or separated by suitable walls or partitions, to prevent the mixing of the aggregates.

When it is necessary to operate trucks or other equipment on a stockpile in the process in building the stockpiles, it shall be done in a manner approved by the Engineer. Any method of stockpiling aggregate which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has operated, and failure of such samples to meet all grading requirements for the aggregate shall be considered cause for discontinuance of such stockpiling procedure.

73.18 TEST METHODS

In stating requirements for most materials Item 73, reference has been made to AASHTO and ASTM Standard Specification for material. Those Specifications, in turn, include reference to the respective AASHTO and ASTM methods of sampling and testing. In a few instances, however, properties of materials in Item 73 have been specified without reference to corresponding AASHTO and ASTM Standard Specifications. In such instances the following methods of sampling and testing will govern:

TEST	TEST METHOD
AASHTO T 11	Amount of Material Finer than 0.075 mm Sieve in Aggregate
AASHTO T 19	Unit Weight of Aggregate
AASHTO T 27	Sieve Analysis of Fine and Course Aggregates
AASHTO T 88	Particle Size Analysis of Soils
AASHTO T 89	Determining the Liquid Limit of Soils
AASHTO T 90	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T 96	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate of Magnesium Sulfate
AASHTO T 182	Coating and Stripping of Bitumen Aggregate Mixtures
See Below	Heat-Stable Additives used in Hot Bituminous Mixtures

Test Method for Heat-Stable Additives.

(a) Place fifty grams of treated asphalt cement heated to 325° F (treated at manufacturer's recommended percent of heat-stable asphalt additive) in a clean container.

(b) Seal the container securely and place in an oven heated to 325° F and hold at this temperature for twenty-four hours.

(c) Remove sample from oven and after thorough stirring, use the asphalt cement for mixing with the mineral aggregate as specified in the stripping test.

(d) The aggregate-asphalt mixture shall then be subjected to the stripping test.

(e) This test shall be conducted as often as deemed necessary by the Engineer.

Stripping Test

Fifty grams of the mineral aggregate passing the 1/2 inch and retained on the No. 4 sieve are washed and surface dried. The selected aggregate is coated with the blend by thorough stirring of the mixture heated to 250° F. Either of the following stripping tests may be employed. (Method (b) is intended primarily for field test.)

(a) The coated aggregate is immersed in previously boiled distilled water at 104° F. The covered beaker containing the mix is placed overnight in an oven maintained at 140° F. At the end of the heating period (approximately eighteen hours), there shall be no evidence of stripping of the asphalt as determined by visual inspection.

(b) The coated aggregates shall be placed in boiling water and boiling continued for one minute. The water shall then be poured off the mixture and the mixture removed and placed on a paper towel. The coated aggregate shall show no signs of strippings as determined by visual inspection.

END OF DOCUMENT