



**HIGHWAYS DEPARTMENT**

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**GUIDANCE NOTES  
ON  
CENTRALISED SAMPLING AND TESTING OF  
AGGREGATES, FILLER AND BITUMEN USED  
FOR PRODUCING BITUMINOUS MATERIALS**

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**Research & Development Division**

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## **1. Introduction**

- 1.1 These Guidance Notes promulgate that the Research and Development Division of the Highways Department (HyD) offers assistance to the offices of the HyD in sampling and testing of the coarse and fine aggregates, filler and bitumen which are used for producing bituminous materials. These Guidance Notes set out the sampling and testing methods according to the General Specifications for Civil Engineering Works (1992 Edition) (GS), methods and frequency of sampling and testing and the dissemination of results.

## **2. Background**

- 2.1 Bituminous paving materials are mixtures of aggregates, filler, bitumen and other additives. The properties of these constituents play an important role to the performance of the bituminous materials. Therefore, the aggregates, filler and bitumen used for producing bituminous materials need to be tested and appropriate testing methods are specified in the GS. However, these tests are often a repeat of work undertaken by others because the constituents of a particular bituminous mix normally come from the same refinery source or quarry. Besides, the information on non-compliance of these constituents under a particular Contract may not be readily available to all staff in the HyD and other works departments.
- 2.2 In order to improve the efficiency of the material testing and to disseminate the information effectively, the Research and Development Division has undertaken the centralised quality control of the aggregates, filler and bitumen by sampling these materials and delivering them to the Public Works Laboratory (PWL) for testing on a regular basis. The test results are made available to the offices in HyD and other relevant departments for reference.

## **3. Sampling and Testing of Aggregates and Fillers**

- 3.1 The coarse and fine aggregates are sampled at the cold bins whereas the crushed rock filler is sampled at the bituminous materials batching plant. The hydrated lime, which is a type of filler, is sampled from the storage bags. These materials are generally sampled once in every three months for testing but this frequency of sampling and testing is subject to change as and when required.
- 3.2 The coarse and fine aggregates, and fillers are then delivered to the PWL for testing by the appropriate methods. The sampling methods and testing standards for these materials are described in Table 1:

Table 1 : Sampling and Testing of Aggregates and Filler

Material	Property	Sampling Method	Test Method
Coarse aggregate <sup>(1)</sup>	Relative density and water absorption	BS 812 : Part 102	BS 812 : Part 2
	Ten percent fines value		BS 812 : Part 111
	Particle size distribution		BS 812 : Part 103.1
	Flakiness index		BS 812 : Part 105
Fine aggregate	Relative density and water absorption	BS 812 : Part 102	BS 812 : Part 2
	Particle size distribution		GEO Report No.36, Test 2.9.2B
Filler <sup>(2)</sup>	Relative density	ASTM D242	BS 4550 : Part 3
	Particle size distribution		BS 812 : Part 103.1

Notes : (1) Coarse aggregate comprises crushed rock retained on a 5 mm BS test sieve.

(2) Filler is crushed rock filler or hydrated lime.

#### **4. Sampling and Testing of Bitumen**

4.1 Generally, bitumen is sampled at the refinery source and the service tank at the bituminous materials batching plant, or from the drum if the bitumen is stored and delivered in drums. Bitumen is sampled in accordance with ASTM D140.

4.2 The bitumen is then delivered to the PWL for testing by the appropriate methods for determining different properties. The testing standards and the recommended frequency of sampling and testing of bitumen are described in Table 2:

Table 2 - Sampling and Testing of Bitumen

Test	Test Method	Frequency of Sampling and Testing		
		At Storage Tank of Bitumen Supplier	At Batching Plant of Bituminous Materials Suppliers	
			Service Tank	Drum
Penetration	ASTM D 5	Once every month	Once every month	Once every month
Relative density	ASTM D 3289	Once every three months	Once every Three months	Once every Three months
Softening point	BS 2000			
Ductility	ASTM D 113			
Retained penetration after thin film oven test	ASTM D 1754			
Solubility	ASTM D 2042			
Viscosity	ASTM D 2171			
Loss of heating	BS 2000			

Note : Frequency of sampling and testing is subject to change as and when required.

## **5. Reporting of Test Results**

- 5.1 The Research and Development Division of the HyD collects the test results of the aggregates, filler and bitumen from the PWL and assesses the data with reference to the requirements specified in the GS. A summary of the test results is made available to the HyD offices for reference. In case of non-compliance of the materials, the Research and Development Division shall arrange retesting and the results of the re-tests shall be made available to the officers in the HyD.
- 5.2 The test results shall also be available to other relevant works departments including the Territory Development Department, Housing Department and Civil Engineering Department for their reference.
- 5.3 Engineers are recommended to approach the Research and Development Division if they have any query or require more information on the properties of the constituents of the bituminous materials.