AHLSTROM

Laboratory Applications
of Filter Paper:
Construction

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Construction Laboratory Applications of Filter Paper

ASTM – American Standard Test Methods

ASTM C114-11b Chemical Analysis of Hydraulic Cement

Hydraulic Cement is tested for the presence of multiple elements with this procedure. Quantitative filters, Type II ASTM 832 E, F and G (Ahlstrom **Grades 54, 74,** and **94** respectively) are recommended for various steps in the process.

- Insoluble residue: **74**
- Ammonium Hydroxide: **74**
- Calcium Oxide: **74** and **94**
- Calcium Oxide (alternative test method): **94**
- Chloride: **54**
- Chloroform-Soluble Organic Substances: **74**
- Magnesium Oxide: **74** and **94**
- Magnesium Oxide (alternative test method): **74**
- Manganic Oxide: **74**
- Phosphorus Pentoxide: **74**
- Phosphorus Pentoxide (alternative test method): **74**
- Silicon Dioxide: **74**
- Sodium and Potassium Oxides: **74** and **94**
- Titanium Dioxide (alternative test method): **74**

ASTM C204-11 Fineness of Hydraulic Cement by Air Permeability Apparatus

The Blaine Freeness Apparatus is used to measure the relative freeness or fineness of hydraulic cement. **Grade 613** is used to protect the porous disc in the test equipment from test sample intrusion.

ASTM C941-10 Water Retentivity of Grout Mixtures for Preplaced-Aggregate Concrete in the Laboratory

The water retentivity of concrete aggregates is determined with this test. The retentivity indicates the ability of the mix to retain water, which relates to the elasticity of the material. A Buchner funnel with ASTM 832 Type 2 Class G filter, **Grade 94**, is used to vacuum filter a sample.

ASTM C1084-97 Portland-Cement Content of Hardened Hydraulic-Cement Concrete

This test method provides two ways to identify the percent of Portland cement within hardened hydraulic-cement concrete. The oxide analysis procedure calls for Grade 94 and the Maleic Acid Extraction procedure calls for **Grade 54**.

ASTM D-425-88 Centrifuge Moisture Equivalent in Soils

The moisture equivalent and porosity is used to give an estimate on aquifer storage coefficient. A dry sample of soil is placed in a gooch crucible that is lined with **Grade 74**, which is then placed in a water bath till the soil reaches stable saturation. The paper works as both a wick and barrier.

ASTM D560-03 Freezing and Thawing Compacted Soil Cement Mixtures

The purpose of this procedure is to determine the minimum cement content needed in a soil/cement mixture to achieve a degree of hardness adequate to resist field weathering. This procedure requires absorptive pads placed between specimens and to be used as sample carries. **Grade 901** provides an adequate pad.

ASTM D806-96 Cement Content of Soil/Cement Mixtures

The cement content of a dry soil/cement mixture is determined with this procedure. There are several steps, all of which require filter paper. The first extraction is done with Hydrochloric acid; **Grade 601** is recommended. The filtrate is precipitated and filtered with **Grade 54**. Again the filtrate is treated and re-filtered with **Grade 601**. The final precipitate step is filtered with **Grade 94**.

ASTM D1561-92 Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor

A mechanical compactor consolidates test specimens to replicate the equipment being used for the compaction of asphalt concrete pavement. **Grade 613** or **Grade 615** is installed between the asphalt mixture and the mold to prevent sticking during the compaction process.

ASTM D1883-07 CBR (California Bearing Ratio) of Laboratory-Compacted Soils

Laboratory compacted samples of pavement subgrade, subbase, and base/course materials are tested for California Bearing Ratio, which defines the strength of cohesive materials. **Grade 615** is used as a spacer disc to prevent the samples from sticking to the test equipment.

ASTM 2042-09 Solubility of Asphalt Materials in Trichloroethane

An asphalt sample is washed with Trichloroethane to remove the soluble portion of the sample. The insolubles are collected on the surface of a binder-free glass **Grade 161**. The residue and filter are then dried, and the insolubles, gravimetrically determined.

ASTM D-2172-11 Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

This procedure has five, A-E, methods in which to evaluate bitumen content. Method A is done using a centrifuge extractor. A filter paper disc, placed in the centrifuge, is used to collect the extract from the sample. The filter disc is then tested. **Grade 901** meets the requirements for the filter rings. Method B is done using a reflux extractor. The reflux extractor consists of two cone type screens. The filter paper used with this extraction method is **Grade 615**. Method E utilizes a vacuum extractor. This test requires a medium grade fast filtering qualitative filter. **Grade 615** is ideal for this procedure. Methods C and D do not use paper.

ASTM D2435-11 One-Dimensional Consolidation Properties of Soil

The magnitude and rate of consolidation of soil is determined to estimate both differential and total settlement of a structure or earth fill. The sample is restrained laterally and drained axially while subjected to an applied, controlled stress loading. **Grade 55** is used to prevent intrusion of the soil sample into the porous disc.

ASTM D2844-07 Resistance R-Value and Expansion Pressure of Compacted Soils

This information is gathered to predict the R-value and Expansion pressure of soil that would be subjected to road traffic. The test is done with a stabilometer and expansion pressure device. This test needs absorptive pads between the sample and the mold to prevent sticking. The method calls for a creped filter, **Grade 615** and a smooth filter, **Grade 613**.

ASTM D3999-11 Determination of the Modulus and Damping Properties of Soils Using the Cyclic Triaxial Apparatus

The test is done using a Pore Water Pressure Measurement Device and a Triaxial Apparatus. **Grade 55** is recommended in the saturation phase of the procedure. It functions as a dry drainage system.

ASTM D4542-07 Pore Water Extraction and Determination of Soluble Salt Concentration of Soils by Refractometer

The salt concentration of the water in the soil is tested with this method. The sample is placed in a press with **Grade 74**. The sample is compressed and the extracted water collected and tested with a refractometer.

ASTM D4767-11 Consolidated, Undrained Triaxial Compression Test for Cohesive Soils

The strength and stress-strain relationship of a cylindrical specimen of saturated cohesive soil is tested with this method. **Grade 55** is used both as a prefilter to the porous disc and filter strips to expedite the test.

ASTM D5084-10 Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

This method applies to one-dimensional, laminar flow of water within porous materials such as soil or rock. Filter paper, **Grade 55**, is used between samples and is placed at the tops and bottoms of the porous end pieces. The media choice depends on the fineness of the test solution.

ASTM D5298-10 Measurement of Soil Potential (Suction) Using Filter Paper

Laboratory filter paper is used as a passive sensor to evaluate the soil matrix and total potential (suction). The filter paper is enclosed with the soil sample until moisture equilibrium is reached. **Grade 94** is commonly used for this procedure.

ASTM D5891-02 Fluid Loss of Clay Component of Geosynthetic Clay Liners

The clay slurry is filtered through a fine hardened filter. The amount of time to extract a certain volume of water from the sample is determined. **Grade 95** is used for this test.

Brand Cross Reference

Ahlstrom	Media Type	Whatman	S&S	Advantec	Albet	Munktell
54	Quantitative	41	589/1		FP589/1	388
55	Quantitative Hardened	54	1505		FP1505, FP1573	388
74	Quantitative	40	589/2	5B, 3	FP589/5	389, 390
94	Quantitative	42	589/3	5C	FP589/3	393
95	Quantitative Hardened	50	1507		FP1507, FP1574	391
161	Glass Microfiber	934 AH	GF50			MG 550-HA
601	Qualitative	1	597	2	2043A	1, 1002, FN3
613	Qualitative		595			3hw, 4b, 3m/N

Conversion tables are provided to guide you in selecting an Ahlstrom grade that is most closely equivalent to your current brand of filter.
Please note that grade comparisons between manufacturers are approximations based upon generally accepted industry practices.
These comparisons are based on laboratory data for thickness, weight and flow rate and have been substantiated through testing at Ahlstrom

ASTM E 832-81 Standard Specification for Laboratory Filters

This standard specifies and defines the filter requirements and nomenclature used to reference recommended filter types in the various ASTM procedures. Following is a table with the Ahlstrom grade recommendations for the standard filter types.

Type I	Description	Precipitate retention	Grade
Class AA	Very coarse, very fast, gelatinous	Ferric Hydroxide	615
Class A	Coarse, fast, gelatinous	Ferric Hydroxide	631
Class B	Medium precipitate, medium flow	Lead Sulfate	613 or 601
Class C	Fine precipitate, slow flow	Barium Sulfate	610
Class D	Hardened, fine precipitate, slow flow	Barium Sulfate	95
Type II	**Description**	**Precipitate retention**	**Grade**
Class E	Coarse, fast, gelatinous	Ferric Hydroxide	54
Class F	Medium precipitate, medium flow	Lead Sulfate	74
Class G	Fine precipitate fine flow	Barium Sulfate	94

Test Methods

ASTM method	AASHTO method	Title	Recommended Grade	Application
C114-11b	T105	Chemical Analysis of Hydraulic Cement	54, 74, 94	Cement
C204-11	T153	Fineness of Hydraulic Cement by Air Permeability Apparatus	613	Cement
C941-10		Water Retentivity of Grout Mixtures for Preplaced-Aggregate Concrete in the Laboratory	94	Grout
C1084-97		Portland Cement Content of Hardened Hydraulic-Cement Concrete	54 and 94	Cement
D425-88	T94	Centrifuge Moisture Equivalent in Soils	74	Soil
D560-03	T136	Freezing and Thawing Compacted Soil Cement Mixtures	901	Soil/Cement
D806-11		Cement Content of Soil Cement Mixtures	54, 601, 94	Soil/Cement
D1561-92		Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor	613 or 615	
D1883-07	T193	CBR (California Bearing Ratio) of Laboratory-Compacted Soils	615	Soil
D2042-09	T44	Solubility of Asphalt Materials in Trichloroethane	161	Asphalt
D2172-11	T164	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures	901 or 615	Paving Mixtures
D2435-11	T216	One-Dimensional Consolidation Properties of Soil	55	Soil
D2844-07	T190	Resistance R-value and Expansion Pressure of Compacted Soils	613 and 615	Soil
D3999-11		Determination of the Modulus and Damping Properties of Soils using the Cyclic Triaxial Apparatus	55	Soil
D4542-07		Pore Water Extraction and Determination of Soluble Salt Concentration by Refractometer	74	Soil
D4767-11		Consolidated, Undrained Triaxial Compression Test for Cohesive Soils	55	Soil
D5084-10		Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter	55	Porous Materials
D5298-10		Measurement of Soil Potential (Suction) Using Filter Paper	94	Soil
D5891-02		Fluid Loss of Clay Component of Geosynthetic Clay Liners	95	Clay Liners

Test Method Summary ASTM – American Standard Test Methods. AASHTO – American Association of State Highway and Transportation Officials.

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Ahlstrom is a high performance materials company, partnering with leading businesses around the world to help them stay ahead. Our products are used in a large variety of everyday applications, such as filters, medical gowns and drapes, wallcoverings, flooring, labels and food packaging. We have a leading market position in the businesses in which we operate. Our 5,200 employees serve customers in 28 countries on six continents. In 2011, Ahlstrom's net sales amounted to EUR 1.6 billion. The company's share is quoted on the NASDAQ OMX Helsinki. More information is available at www.ahlstrom.com.