

Chemistry in Highway Construction

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The Division of Highways of the State of Illinois, in its Bureau of Materials at Springfield, maintains a completely equipped chemical laboratory. The principal work of this laboratory is the analysis of the materials used in the construction and maintenance of the highways. The laboratory also develops procedures for testing materials, investigates new types of material, and assembles data for use in the preparation of specifications.

The new laboratory building, constructed in 1934, is modern in every respect and has six well appointed laboratory tables. The general equipment includes Chainomatic balances, constant temperature ovens, electric muffle, centrifuge, Barnstead still, constant temperature water baths, combustion apparatus, constant humidity cabinet, microscope, refractometer, potentiometer, tintometer, Soxhlet extractors and electrolytic apparatus. Equipment for testing refinery products includes thermostatic viscosimeters, ductility machine, New York Testing Laboratory penetrometer, Tag closed tester, gasoline distillation apparatus, Dulin rotarex and Union colorimeter. Recent additions to the laboratory equipment are a Precision penetrometer, a Hubbard Field asphalt stability testing machine, and a Frigistat for cloud and pour point determinations which can reduce the temperature to -70°F .

All materials purchased by the Division of Highways are required to comply with carefully prepared specifications which are published as the Standard Specifications for Road and Bridge Construction. Chemical analyses are made of representative samples of all of the materials which are to be used for construction and maintenance. These samples are classified into four groups and the types of tests are designated as Quality Tests, Preliminary Tests, Acceptance Tests, and Check Tests.

Samples for Quality Tests are representative specimens of material which are subjected to detailed investigation in order to obtain as much information as possible concerning the quality of the product. Samples for Preliminary Tests are representative specimens of materials submitted by manufacturers and producers in order to secure information concerning the suitability of their products for the work of the Division of Highways. The results of these tests are useful in locating possible sources of supply for quality products.

Samples for Acceptance Tests are representative specimens of materials which are to be used in the construction and maintenance of the

highways. These samples are always taken by an official representative of the Division of Highways and are tested for compliance with the particular specifications under which they were purchased. Analyses of such samples are the major part of the work of the laboratory. Samples for Check Tests are representative specimens of materials which may not appear satisfactory when received at destination. Check Tests are also made on materials which have been stored for some length of time, and on materials which have been accepted at the place of manufacture by an inspector working away from the Springfield laboratory.

During the past year nearly four thousand samples were tested by the laboratory, representing 300 types of materials (Table I).

TABLE I.—CHEMICAL LABORATORY, CALENDAR YEAR 1935

Material	Number of samples					Quantity tested
	Quality	Prelim.	Check	Accept	Total	
Asphalt—Cement.....	87	6	25	548	666	8,300 tons
Cut-back.....						1,350,000 gals.
Bituminous Joints and Planks.....		1		204	205	850,000 lin. ft.
Bituminous Mixes.....	26	1	4	298	329	14,000 tons
Calcium Chloride.....				33	33	1,100 tons
Cement.....	1		374	24	399	1,900,000 bbls.
Creosote Oil.....		1	3	96	100	500,000 gals.
Galvanized Materials....	5		135	10	150	2,000 tons
Lubricants.....	9		4	378	391	62,000 gals.
Paint Materials.....	9	4	1	330	344	46,000 gals.
Road Oils.....	4	1	1	978	984	11,600,000 gals.
Tars.....	1	1	41	125	168	800,000 gals.
Miscellaneous.....	47	7	3	146	203	
Totals.....	189	22	591	3,170	3,972	

When materials such as refinery and paint products are purchased in large quantities during a short period of time, an inspector goes directly to the plant and tests the product during the progress of the manufacture. Such a procedure is convenient for the Division of Highways, the contractor and the materials producer and gives assurance that all the materials produced and shipped to the construction site comply with the specifications under which they were purchased. Check Tests on these materials are made in the Springfield Laboratory.

In addition to the materials tested for the Division of Highways and State Aid work, samples are also tested for other State Departments and the various counties, townships and cities of the State. Recently the laboratory has tested materials used for roads built under the N. R. A., the P. W. A., and the W. P. A. The laboratory cooperates with the Highway Laboratories of other States and the U. S. Bureau of Standards.