Traffic Paint Tests

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SYNOPSIS

TRAFFIC-paint-testing procedures are reviewed in an attempt to determine which tests might be considered as standard. Although there is no official set of standard tests for traffic paints, those in use by a large percentage of consumers and those established by ASTM are considered as standard.

Certain laboratory control tests together with small scale road tests are given as the most effective means available at the present time for evaluating candidate traffic paints.

Laboratory tests as used to predict traffic paint durability are considered unreliable without further testing details and clarification.

Current ASTM efforts to establish accelerated laboratory traffic-paint tests for durability and suspension are reviewed. The need for such accelerated tests is emphasized in order to permit performance rather than compositional specifications.

● SUITABLE tests for traffic paint compositions are problems of major importance. These problems are faced by every state highway department in writing reliable traffic paint specifications. Further, the manufacturers, as well as the consumers, are faced with these same problems because various compositions must be evaluated and the more promising candidates selected. For the most part, laboratory and road tests are used in order to determine the compositions which offer most promise. Although actual road tests are believed to be the safest testing procedure to follow, such procedures, of course, require considerable time and do not give the consumer adequate protection against faulty compositions. Obviously it is important that reliable, accelerated laboratory testing procedures be developed. Many accelerated testing procedures have been tried and are being tried. At present, however, there is little agreement regarding a preferred accelerated testing procedure for traffic paint.

STANDARD TESTS

In the evaluation of candidate traffic paints, laboratory control tests and small scale road tests are commonly used (1). Although there is no official set of standard tests for traffic paint, the tests in use by a large percentage of consumers might be considered as standard. Further, certain standards and standard methods of test have been established by the American Society for Testing Materials and insofar as possible such generally accepted and established testing procedures should be used.

Laboratory Control Tests

Laboratory control tests which are widely used include composition, consistency and drying time. Other tests which are reasonably well established and which might be included for control purposes are bleeding and suspension. Since these tests are described in considerable detail in the literature already published, pertinent references are supplied and such details omitted from this paper.

Compositional determinations should cover such possible variables as gallon weight, percent pigment, percent vehicle and total solids (2). Under some conditions it may be desirable to carry the analysis further to determine the type and amount of pigment present also the type and amount of resin or oils or both used in the binder. Obviously the amount

of such analytical work will depend to a considerable extent on the degree of control desired.

Consistency (2) measurements are important because such information serves as an effective control and is helpful in judging application characteristics. Consistency limits should be set for the particular paint and application procedure which is to be used. Consistency changes on aging are an indication of poor can stability which in turn may result in poor durability.

Drying Time[1] is a very important characteristic of traffic paint because the traffic line when applied must be protected during the dry to no-pick-up period. The emphasis on shorter drying times is increasing. This becomes doubly important where spray applications are made at the rate of some 15 mph. (3). Obviously under such conditions a slow dry to no-pick-up time would require a very considerable number of flags in order to insure adequate protection from traffic throughout the drying period. In some instances a sacrifice in durability is accepted in order to obtain improved drying characteristics.

Bleeding[2] is defined as the relative condition of discoloration manifested in traffic paint when applied to tar or asphaltic roads. Accordingly, paints designed for tar or asphaltic roads should be examined carefully by means of control bleeding tests. Further, the laboratory bleeding test as developed by ASTM is an easy test to run and is sometimes helpful in detecting unsuspected compositional changes.

Suspension[3] tests on traffic paints are desirable and helpful. The tendency to include coarse particles in the pigmentation of traffic paint compositions in order to obtain improved night visibility serves to increase the possibility of poor suspension. Obviously, suitable suspension limits should be set and control tests used in order to insure that these suspension limits are met.

The above-mentioned laboratory control tests listed as standard because of common usage should not be considered as a completed list. It is certain that additional standard tests, many of which are in use by various consumers, are desirable. In most instances, however, additional information is needed either on reliability or testing procedure in order to encourage general adoption.

Small-Scale Road Tests

Small-scale road tests are used widely to obtain practical drying time, durability and visibility comparisons. The method of making such small scale road tests is well established.[4] In this connection, however, the location and type of road is an important consideration (4) as wide differences in performance can result from such variables. In general, paints show better durability on a bituminous surface (rock asphalt) than on cement concrete (2c).

Drying time as determined from small scale road tests may vary considerably from the rating obtained in the laboratory under more constant conditions. Obviously, the weather, especially temperature and humidity, the manner of application and the amount, as well as type, of paint applied are factors in the drying times obtained from actual road tests. Drying times under adverse conditions can be an important consideration. Accordingly, an opportunity to obtain such information should not be overlooked.

Durability is one of the prime considerations in traffic-paint evaluations (5). The type of failure most frequently encountered is chipping.[5] Sometimes, however, erosion failure[6] is observed. The relative durability of traffic paints can be rated satisfactorily by the use of transverse lines. This is particularly

[1]Method of Test for Dry to No-Pick-Up Time of Traffic Paint (D 711-48), 1949 Book of ASTM Standards, Part 4, p 388.

[2]Tentative Method of Laboratory Test for Degree of Resistance of Traffic Paint to Bleeding (D 969-48T), 1949 Book of ASTM Standards, Part 4, p. 382

[3]Method of Test for Evaluating Degree of Settling of Traffic Paint (D 869-48), 1949 Book of ASTM Standards, Part 4, p 397.

[4]Method of Conducting Road Service Tests on Traffic Paint (D 713-46), 1949 Book of ASTM Standards, Part 4, p 395

[5]Tentative Method of Evaluating Degree of Resistance of Traffic Paint to Chipping (D 913-47T), 1949 Book of ASTM Standards, Part 4, p 384.

[6]Method of Evaluating Degree of Resistance of Traffic Paint to Abrasion Erosion, or a Combination of Both, in Road Service Tests (D 821-47), 1949 Book of ASTM Standards, Part 4, p. 376

true when the paints are placed on narrow pavements and different portions of the line are subjected to extreme variations in the amount of traffic (2c).

Visibility is without question a pertinent requirement for traffic paints. The most common practice is to judge day and night visibility by eye (1). In some instances. photographic methods are used. Within the last few years portable night-visibility instruments have been made available which are very helpful in making such ratings (6) and a tentative method of test has been established.[7]

Tests in Use by Various Consumers

Several traffic-paint tests other than those given as standard are used by various consumers (1, 2). As listed in the approximate order of popularity these tests cover:

1. Flexibility
2. Water resistance, hot and cold
3. Hiding power
4. Color stability
5. Spreading rate
6. Abrasion, dry and wet
7. Accelerated weathering
8. Skin resistance
9. Adhesion
10. Hardness
11. Alkali resistance
12. Light sensitivity
13. Daylight reflectance
14. Dilution test
15. Stability

No attempt will be made to discuss these various tests in detail. Certain conclusions are available from published data, however, which may be of interest in connection with further consideration of some of these tests.

According to Goetz (2c) the degree of flexibility as measured by 32 test variations shows no correlation whatever with road durability on concrete pavements. It is stated, however, that the modified wet-abrasion test and the water-resistance test show a direct correlation with field durability. The dry-abrasion test gave no positive correlation between test constants and road performance. Hardness is stated to have an important bearing on the test results obtained with the abrasion machine. Also, the correlation between alkali resistance and road durability is rated as negative.

It is stated by Skett and Herbert (7) that actual road tests gave check results regardless of the type of road, traffic count, method of application, and spreading rate. In general, abrasion tests are stated to give more reliable information on durability than flexibility tests. No one laboratory test or combination of tests used was sufficient to evaluate correctly the durability of traffic paints.

Allen (8), in an ASTM progress report, states that the adhesion, flexibility, and hardness tests examined show no general correlation with field service behavior. However, very close correlation is reported with field service behavior of the samples of traffic paint examined by the abrasion test developed by Leavitt (Maine State Highway Commission) and the combined accelerated weathering and abrasion tests developed by Hickson (National Bureau of Standards) and Werthan (New Jersey Zinc Co.).

Shuger (2d) stated that paints which pass a severe bend test do not necessarily give better road performance. Further, it is stated that paints which possess durability exhibit good abrasion resistance. However, it is possible that a paint with poor durability can show excellent results on an accelerated wear test. Accelerated-weathering tests are mentioned as useful in rating comparative chalking and color failure. However, no great progress has been made on accelerated weathering to secure checking, cracking and adhesion failures which are the types most often encountered in traffic paints.

Light sensitivity[8] of traffic paint is a property which can have a definite bearing on visibility. Accordingly, a test of this type can serve as a helpful control. Likewise, hiding power, daylight reflectance, dilution, and stability tests (2a) can be useful control tests. Under certain limited conditions a skid-resistance test may be of value. Spreading rate generally can be varied widely by adjustments in consistency and application technique.

[7]Tentative Method of Test for Night Visibility of Traffic Paints (D 1011-49T), 1949 Book of ASTM Standards, Part 4, p 392.

[8]Method of Test for Light Sensitivity of Traffic Paint (D 712-47), 1949 Book of ASTM Standards, Part 4, p. 390.

CURRENT INFORMATION ON ASTM

Subcommittee IV, ASTM Committee D-1 currently is working on accelerated laboratory traffic-paint tests for durability and suspension. Further, consideration is being given to specifications on glass beads as used to improve the night visibility of traffic paints.

The work on accelerated traffic-paint tests for durability is being centered around combined accelerated weathering and abrasion tests also, combination laboratory tests involving hardness, hot water resistance and accelerated weathering. Cooperative tests are in progress but as yet no official reports, beyond the references already given, have been released.

Accelerated suspension tests on traffic paints are in progress. Hot and cold cycles are being used to accelerate settling and an attempt is being made to correlate the accelerated paint settling with normal shelf aging. Consideration is being given as well to a possible correlation of 2-week and 6-month suspension ratings.

In connection with the development of suitable accelerated tests on traffic paints for durability and suspension a maximum testing period of two weeks is believed by many to be highly desirable. Accordingly, a 2-week time limit is included as a part of the goal in the work under way on accelerated tests.

POSSIBLE VALUE ON TESTS IN USE

All of the tests listed here and considered as standard are beneficial and helpful control tests for traffic paint compositions. This would include the laboratory control tests and the small-scale road tests. Further, such tests are used widely and considered important by many consumers.

The tests listed as in use by various consumers might be considered as optional. In certain instances, tests on hiding power, color stability, or light sensitivity, daylight reflectance, dilution, and stability can be helpful controls. The possibility of using such tests as flexibility, water resistance, abrasion, accelerated weathering, adhesion, and hardness to predict ultimate durability is questionable. Certainly, further testing details and a clarification of the meaning of the results obtained are needed before such tests can be used with confidence.

The fact that composition specifications are extensively used is adequate evidence that suitable accelerated testing procedures are not available. In this connection reliable accelerated laboratory tests on traffic paints for durability and for suspension are needed urgently. If accelerated tests could be made available which would be adequate in predicting performance characteristics insofar as durability and suspension are concerned then performance specifications could be used. Such a change in traffic-paint-specification practice would be highly desirable from the standpoint of both the manufacturer and the consumer.

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