INTERNATIONAL

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Standard Practice for Representative Field Sampling of Traffic Paints[1]

This standard is issued under the fixed designation D8008; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures for obtaining representative field samples of mixed or unmixed waterborne, solventborne, or other liquid traffic ~~paints~~ paints, including two component reactive materials from drums, totes, or machine striping tanks. Traffic paint samples are often taken from storage containers in the field by paint suppliers or government agencies for laboratory testing to determine product quality and/or for approvals prior to striping. It is important that the samples taken are "representative" (have a composition reflecting the overall composition in the container). Although traffic paints can remain homogeneous for weeks or months, some will stratify over time and become non-homogeneous. Obtaining a representative sample can be challenging particularly in a field environment. The desired method for obtaining a liquid sample is to thoroughly mix the sample until homogeneous and then sample the mixture from the top. If complete mixing can't be verified then an alternative practice is to obtain a sample using a liquid tube sampling device. These devices have the ability to capture a top-to-bottom core of paint from the container. Inner or outer rod tube samplers are recommended for sample extraction. The inner rod tube sampler is the preferred sampler.

1.2 The practice selected for representative sampling should have written agreement between the parties providing the product and those testing the product.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D1475 Test Method for Density of Liquid Coatings, Inks, and Related Products
D3925 Practice for Sampling Liquid Paints and Related Pigmented Coatings
D5495 Practice for Sampling With a Composite Liquid Waste Sampler (COLIWASA)

2.2 *ISO Documents:*[3]

ISO 1513 Paints and varnishes — Examination and preparation of test samples
ISO 15528 Paints, varnishes, and raw materials for paints and varnishes — Sampling

3. Terminology

3.1 *The following terms apply to this practice:*

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[1] This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.44 on Traffic Coatings.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3.1.1 *COLIWASA (composite liquid waste sampler), n*—a tube type device that is typically used as a zone sampler for many types of liquids.

3.1.2 *composite core sampler, n*—a compartmented tube type sampler that is potentially capable of obtaining a representative core sample.

3.1.3 *core sample, n*—a sample extracted from a container top-to-bottom with a tube type device.

3.1.4 *liquid scoop, n*—a type of liquid thief sampler with compartments and slide closure that potentially can be used to obtain a representative core sample

3.1.5 *liquid thief sampler, n*—a tube or scoop device used to extract a liquid sample.

3.1.6 *pigment settling/pigment sedimentation, n*—increase in pigment concentration toward the bottom of a container over time mainly due to the effects of gravity.

3.1.7 *representative sample, n*—a paint sample taken from a thoroughly mixed container, or a paint sample taken by suitable means from a partially mixed or unmixed container that has a composite composition equivalent to that of a thoroughly mixed container.

3.1.8 *stratification, n*—separation of a mixture of materials into layers based on density.

3.1.9 *syneresis, n*—a clear liquid separation at the top of a paint typically resulting from movement of lower density continuous phase components upward in a paint.

3.1.10 *uniform sample, n*—see **representative sample**.

3.1.11 *water float, n*—small amount of water added to the top of a tote or drum of fast-dry waterborne traffic paint to prevent skinning.

3.1.12 *zone sampler, n*—a sampling device that samples from a selected location within a container; a zone sampler produces a non-representative sample unless the container contents are homogeneous.

4. Summary of Practice

4.1 This practice provides methods for obtaining "representative" traffic paint samples from storage containers in the field.

4.2 *Traffic Paint*—Traffic paints are essentially pigment dispersions consisting of a continuous phase, a polymeric binder, finely ground pigments (typically white or yellow), and various additives in small amounts such as a pigment dispersant, thickener, defoamer, and biocide. The continuous phase in a typical waterborne traffic paint is water with smaller amounts of methanol and/or coalescing solvent, and the binder is a synthetic latex. The continuous phase for solventborne traffic paint is one or more organic solvents, and the binder is typically an alkyd resin. In this document, traffic paint can also reference two component pavement marking materials such as epoxy, modified epoxy, and polyurea which require the mixing of a pigmented resin portion with a non-pigmented catalyst portion at closely controlled, specified proportions immediately prior to application onto the pavement.

4.3 *Traffic Paint Containers*—The paint containers most often sampled in the field are drums, totes, or striping machine tanks. Common traffic paint tote sizes are 250 gal (946 L), 275 gal (1040 L), or 330 gal (1249 L), and they are typically of plastic (poly) or stainless steel construction. The heights of standard containers are: 55 gal drums, 34 ~~in~~in. (86 cm); 250 gal totes, 40 in. (102 cm); 275 gal totes, 46 in. (117 cm); and 330 gal totes, 54 in. (137 cm). Striping tank containers vary in size. Tube type sampling devices should be long enough to reach the bottom of the container being sampled.

4.4 *Field Sampling*—Government agencies such as Departments of Transportation (DOTs) often conduct field sampling of traffic paints from containers for laboratory testing to determine the paint's conformity to specifications and for approval before application to a roadway. Suppliers also sometimes sample field containers if there is an issue reported or a quality check is needed. The sample size typically required for laboratory testing is on the order of about 1 qt to 1 gal (1 to 4 L).

4.5 *Change in Paint Composition over Time*—Like most other types of liquid paints, traffic paints are very uniform when first made in production and also initially in the storage containers when shipped out into the field for striping. The paints can be very stable and homogeneous for weeks or months. However, depending on a paint formulation's inherent stability, the paint's viscosity, its storage environment (internal and external), and time in storage, traffic paint in a container may change composition from top to bottom over time. The change in paint uniformity within a container is often simply due to the effect of gravity resulting in the gradual downward settling or sedimentation of the more dense pigments and/or migration of lower density continuous or disperse phase components upward toward the surface. Pigment settling is minimized in the production of traffic paint with a sufficient grind (reduction of pigment particle size), proper stabilization (with optimized dispersants and surfactants) and also by increasing the viscosity of the paint to within specification with a thickener. An eventual non-homogeneous composition of paint within a container is often a vertical gradient distribution of pigment with a corresponding gradient change in solids content (lower at the top and higher at bottom of the container). Over time, this can produce soft settling at the bottom of the container, or in more extreme cases, hard settling (compaction) may occur. Sometimes the continuous phase components (solvents or water) being of lower density can migrate upward toward the surface of the container eventually resulting in a clear liquid separation at the top (syneresis). Another contributor to non-uniformity of waterborne traffic paint in a container is the common practice of adding a small "water float" on top of the paint after filling to prevent skinning. Paint in containers exposed to extreme heat, to long periods of elevated temperature, or to one or more freeze-thaw cycles may have accelerated compositional changes. Obtaining representative samples from non-homogeneous paint containers are addressed in this practice.

4.6 *Sampling Methods*—Practice D3925 addresses procedures for the mixing of liquid paints of any type and in most any size container to obtain representative samples for testing. In that method, thorough mixing of the paint is verified when densities match for zone samples taken from the top and bottom of the container. With the availability of appropriate mixing equipment and a suitable power source, the procedures in Practice D3925 can be used for sampling traffic paint in the field. Since sample uniformity is assured when thorough mixing is achieved, this is a preferred option. However, mixing is often not practical or even possible in a field environment, and complete mixing may not be verifiable. In this situation, an alternative preferred practice is to obtain a representative sample using a liquid thief device that has the ability to capture a top-to-bottom core of paint that is representative when homogenized. The core sample would include any water float but would typically not include any hard sediment if present. ISO 15528 provides general procedures and various types of devices for sampling liquids and solids. However, many of the sampling devices described in ISO 15528 are zone samplers and therefore not capable of capturing a representative paint sample. This practice describes the particular issues involved with the field sampling of traffic paint and best practices for obtaining representative samples from mixed or unmixed containers.

5. Significance of Practice

5.1 For quality assessment and/or approval for use of traffic paint stored in the field, it is often necessary to obtain a representative sample for testing. Correct sampling of traffic paint is a skilled operation, and if not properly conducted with the right equipment and procedures, a sample may inadvertently fail one or more specification tests when evaluated by a testing laboratory. Among the test results that could be affected are solids content, resin content, TiO_2 content, heat-age stability, freeze-thaw stability, and dry time. Any of these could inadvertently result in non-approval or penalties.

6. Apparatus and Procedures

6.1 *Sampling from Thoroughly Mixing Containers:*

6.1.1 *Thorough Mixing with Verification*—A most preferred practice for obtaining a representative sample from a container is thorough mixing of the container contents prior to sampling. Practice D5495 provides guidelines for types of mixers, sample removal, and verification for thorough mixing. Some types of mixers that can be used are impellers, drum rollers, and drum shakers, or the practice of "boxing" where fluid is pumped back and forth between containers for mixing. With Practice D5495, complete mixing is indicated when a sample pulled from the top of a container has a density very close to a sample pulled from the bottom of the container within 0.5 lb/gal (60 g/L). Density is typically determined using a weight/gal cup in accordance with Test Method D1475. If available, efficient mixing can be accomplished using a high speed portable drum or tote mixer. The mixer should have sufficient power, large impeller blades, and shaft long enough to reach the bottom of the container and ideally into the corners of the container. A small blade mixer or under-powered mixer may not produce enough mixing action to efficiently turn over the contents of the container. The mixer can be driven by air, electricity, or hydraulics but should be appropriate for efficiently moving viscous fluids (traffic paints) of moderately high viscosity. Traffic paint viscosity is commonly measured with a Stormer Type viscometer using Practice D562, and a typical viscosity range is 75 to 95 Krebs Units (KU). Over time, the viscosity of traffic paint can increase or decrease during storage, and the viscosity near top of the container may be different (usually lower) than that near the bottom.

6.1.2 *Samplers for Thoroughly Mixed Containers*—If there is assurance (by density comparison or other means) that a container's contents have been thoroughly mixed, a representative sample can be removed using a wide variety of sampling devices from most any location within the container. One such device is a zone sampler. The zone sampler takes a sample from a single location within a container. The recommended sampling location for zone sampling of a thoroughly mixed container is near the horizontal/vertical center of the container. As noted in 6.1.1, zone samples taken from top and bottom will confirm homogeneity with a density match. Some common examples of zone samplers are bottle or can samplers, dip samplers, or bottom zone samplers as shown in ISO 15528 sections 5.1.4 and 5.15. Various tube type samplers such as a COLIWASA can also be used as zone samplers.

6.1.3 *Sampling from an Outlet Valve*—If there is an outlet valve at the bottom of the container (some totes and tanks), a thoroughly mixed container can be sampled through this port. When sampling from an outlet valve, some paint, about 5 gal (about 20 L) should first be drained from the container into a clean bucket before getting the final sample for testing. The usual sample size for testing is approximately 1 qt to 1 gal (1 to 4 L). Any drained material in the bucket not used for testing can be returned to the top of the container.

6.2 *Sampling from Unmixed Containers or when Mixing might be Incomplete:*

6.2.1 Often it is not possible to conduct mixing of field drums, totes, or striping tanks before obtaining a sample for testing. In those instances, a tube or closed scoop sampling device that has the ability to capture a representative paint "core" from top to bottom of the container is required. If undisturbed, the contents of a container may vary from top to bottom for the reasons discussed in 4.4. However, the composition within each horizontal plane should be relatively constant except very close to the container wall. Because of the potential for wall effect, it is generally preferable to sample near the vertical centerline of the container.

6.2.2 *Measuring Sedimentation*—Prior to sampling an unmixed container, the level of pigment compaction, if any, should be assessed. Much of the material that is compacted at the bottom of the container will often remain there when the container is emptied for striping. Consequently, this material will not be part of the composite representative sample when taken for testing. The thickness of hard sediment can be estimated using a measuring stick or rod with a flat surface such as a circular 3 in. disk at one end. First place the rod outside the container with disk at bottom and mark the upper rim height of container on the rod. The rod is then gently inserted down into the paint until the disc sets on top of the sediment layer. Mark the rod with a marker at the same upper rim position, remove the rod, and measure the distance between the two marks. That difference is the sedimentation thickness. An appropriate tube type device could serve a dual purpose to obtain the ~~pain~~paint sample and also to function as a rod for obtaining sedimentation thickness.

6.2.3 To obtain a representative core sample of an unmixed container, an appropriate liquid thieving device that reaches to the bottom of the container is required. The type of tube and the procedure for insertion and extraction are important to obtain a representative sample of paint. Section 6.2.4 describes tube type devices that are not recommended or are otherwise not capable of obtaining a representative paint sample from an unmixed or incompletely mixed container. Section 6.2.5 describes recommended tube type devices that are capable of capturing representative paint samples.

6.2.4 *Tube Type Devices Not Recommended for Sampling of Unmixed or Incomplete Mixed Paint Containers*—A simple tube or valve sampling tube has potential to capture a representative sample, however, these sampling devices have significant issues during extraction and are therefore not recommended for unmixed or incompletely mixed containers. With openings at both ends, a simple tube can enclose a representative core sample of liquid if pushed down into the liquid slow enough to let paint flow up into the tube at a rate close to the rate of insertion. A narrow tube, because of its constricted diameter and the relatively high viscosity of the paint, is undesirable because it will not permit liquid to flow into the tube fast enough resulting in a bottom rich (non-representative) sample. Although a wider tube improves flow of paint into the tube to match the insertion rate for uniform sample capture, there will be an increased tendency for flow out of the tube during extraction which would result in a non-representative sample. To be able to use a wider tube, the tube must have a valve closure at the bottom. One such device is a COLIWASA (composite liquid waste sampler) with an opening on both ends and a valve at the bottom end (Practice D5495). This device is identified as a "Valve sampling tube" in ISO 15528 sections 5.1.33, Fig. 5. Unfortunately, the typical positioning of the valve at the bottom of the COLIWASA restricts flow of paint into the tube during insertion and is therefore not recommended. This device is normally used for zone sampling and thus produces a non-representative sample.

6.2.5 *Sampling Devices Capable of Obtaining Representative Samples from Unmixed or Incompletely Mixed Containers*—The tube type devices in the following subsections are capable of obtaining a representative liquid core sample from a traffic paint container. Some are commercially available, and others may require construction for use. Most of these sampling devices are reusable and must be thoroughly cleaned before reuse. One design uses inexpensive disposable tubes as part of the sampling assembly and therefore does not require cleaning.

6.2.5.1 *Liquid Scoop Sampler*—The cross section of this tube sampling device is D-shaped (a half tube with a slide) that has compartments from one end to the other (see diagram in ISO 1552 in section 5.1.2.2 and Fig. 1-1) and also Fig. 1 of the practice. This liquid thief device can be used to obtain a representative traffic paint sample from a container from top to bottom without mixing. With a liquid scoop, the speed of insertion is of little consequence because liquid does not enter the compartments until the slide is opened. The scoop should be inserted to the bottom of the container with the compartment slide closed. Once at the bottom of the container, the slide is gradually pulled opened (pulled up) to allow liquid to flow into each compartment starting from the bottom. Once all compartments are filled and with the scoop still at the bottom of the container, the slide is closed, and the scoop is removed and drained into a suitable sample container. Upon removal, the contents of the sample should be thoroughly mixed to obtain the composite representative sample. The more compartments there are in the scoop, the more likely a representative sample will be obtained on extraction. A slide scoop with just one compartment (ISO 15528 section 5.1.2.2, Fig. 1 and Fig. 2) would likely contain more material from the lower part of container as it flows up into the channel during slide withdrawal thus resulting in a non-representative sample.

6.2.5.2 *Concentric Tube Sampler*—This tube sampler consists of one inner half section tube that fits snugly within an outer tube (see diagram in ISO 15528 section 5.1.3.1, Fig. 3) and also Fig. 2 of this practice. The outer tube has channels along the length. Before insertion into the paint, the inner half section tube is rotated with a handle at the top to close off the outer tube channels (closed position). The tube is then inserted to the bottom of the paint container, and the inner tube is rotated to open the outer channels permitting liquid to flow in at each level. This device may or may not have compartments. More channel openings and/or more compartments should improve obtaining a representative sample. A possible limitation with this design for waterborne paint is latex getting between the rotating tube surfaces which could easily freeze up in the mechanism.

6.2.5.3 *Inner Rod Tube Samplers*—This tube type sampler consists of a two part assembly that is commercially available in stainless steel (see Fig. 3 of this practice). The first part of the assembly is a rod with disc on one end that is inserted down through liquid material (paint) to the bottom of the container or to a hard sedimentation layer if present. A cylindrical sleeve is then slowly inserted over the rod down through the paint to enclose a representative core sample. For a most representative core sample, the

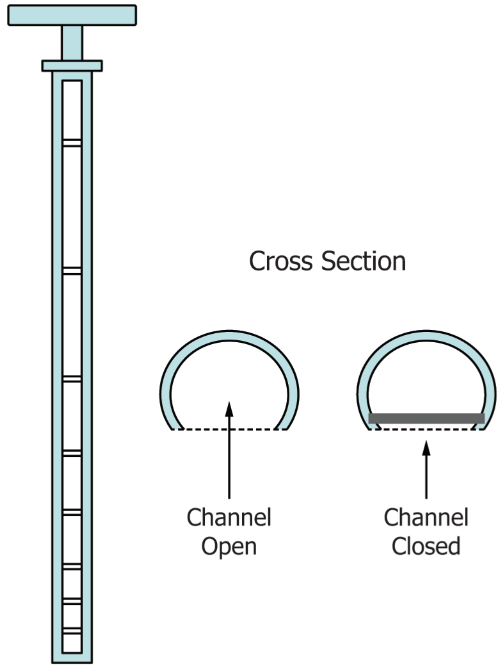

FIG. 1 Scoop-Slide Sampler

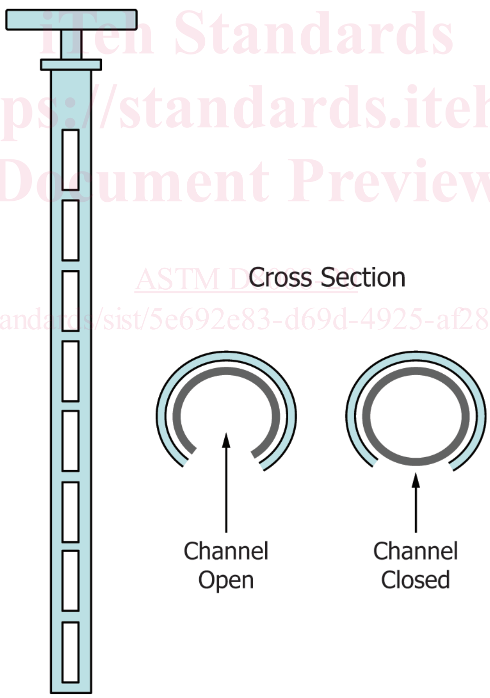

FIG. 2 Concentric Tube Sampler

tube should be inserted slowly enough so that the liquid in the tube stays within 1 in. (2.5 cm) of the surface of the liquid in the container. A flashlight may be helpful to view liquid height during the insertion procedure. When the sleeve tube reaches the bottom of the container, it is sealed by the disc and closed tight by turning the screw crank at the top of the rod. The sample assembly is then pulled out of the container and drained into a suitable container by opening the bottom valve with the rod crank.

An economical and lighter weight version[4] of an inner rod tube sampler can be constructed using disposable clear plastic tubes (sleeves). The plastic tube is inserted in a similar manner slowly down the rod through the paint for a core sample capture (see Fig. 3 of the practice). The plastic tubes are available from tube vendors in standard 1 ft (1.83 m) or custom lengths in either thin

[4] Commercial product of EET Corporation, 3106 Roane State Highway, Harriman, TN 37748.