



ASTM Chemical Standards: Supporting Science, Innovation and Quality Manufacturing

The partnership between ASTM International and the global chemical producing industry has marked by growth and progress for more than 100 years.

Today, ASTM standards make a vital contribution to research, production and environmental safety throughout the chemical sector as well as to the manufacturing of thousands of finished products made from rubber, plastics and many innovative raw materials.



ASTM COMMITTEE D11: PROVEN RELEVANCE IN RUBBER STANDARDS

One of ASTM International's most diverse technical committees impacting the chemical sector is [Committee D11 on Rubber](#). Since 1912, D11 has played an important role in the development of standards used for evaluating rubber and rubber chemicals. Owing to its broad global membership of approximately 315 professionals from 21 countries, D11 is able to deliver high quality standards that are truly relevant to the needs of stakeholders around the world. D11's portfolio of more than 220 standards facilitates communication between producers, users, testing laboratories and customers; assists in material procurement; and helps to define product requirements. Rubber product manufacturers also rely on D11 protocols for evaluating rubber properties and conducting research and development.

Committee D11's ongoing standards activities fall across 15 technical subcommittees and cover three core areas: testing and analysis, raw materials and rubber products. Notable standards include [D412, Test Methods for Vulcanized Rubber and Thermoplastic Elastomers — Tension](#). D412 provides utility for evaluating how the properties of vulcanized thermoset rubbers and thermoplastic elastomers will withstand tensile (tension) forces for adequate performance in certain applications. ASTM [D471, Test Method for Rubber Property — Effect of Liquids](#), covers the required procedures to evaluate the comparative ability of rubber and rubber-like compositions to withstand the effect of liquids. D471 is particularly valuable in industry sectors such as the automotive, where rubber parts such as seals, gaskets and hoses may be exposed to oils, greases, fuels and other fluids during service, causing deterioration and affecting ongoing performance.

D11.40: FOSTERING RELIABILITY IN CONSUMER RUBBER PRODUCTS

D11's most active rubber product-oriented subcommittee is D11.40 on Consumer Rubber Products. A major emphasis among D11.40 activities is material specifications and test methods for rubber gloves used in the health care and food services industries and for contraceptive devices (condoms). In the United States, the U.S. Food and Drug Administration (FDA) regulates both of these product groups and references numerous D11 standards as acceptable methods and specifications to demonstrate regulatory compliance.

Rubber glove manufacturers benefit from such D11.40 standards as [D3577, Specification for Rubber Surgical Gloves](#), which covers the requirements for packaged sterile rubber surgical gloves of both the natural and synthetic rubber latex types. Another similarly significant standard is [D6319, Specification for Nitrile Examination Gloves for Medical Application](#), which offers test procedures for evaluating the performance and safety of nitrile (synthetic) rubber gloves for use in conducting medical examinations and diagnostic and therapeutic procedures. Both

D3577 and D6319 are among the D11 consensus standards that are recognized by the FDA.

D11.40 further demonstrated its responsiveness to both the manufacturing and health care communities when it released in 2009 a medical glove allergen standard: [D7558, Test Method for Colorimetric/Spectrophotometric Procedure to Quantify Extractable Chemical Dialkylthiocarbamate, Thiuram and Mercaptobenzothiazole Accelerators in Natural Rubber Latex and Nitrile Gloves](#). D7558 addresses the issue of residual accelerator chemicals in medical gloves, which can cause allergic contact dermatitis in health care workers. Test methods outlined in D7558 enable rubber glove manufacturers to monitor the level of residual chemicals in their end products and to potentially make manufacturing changes to reduce allergen levels.

The food service industry is another sector benefiting from D11.40 efforts, evidenced by the release of [D7329, Specification for Food Preparation and Food Handling \(Food Service\) Gloves](#). D7329 is recognized as one of the most comprehensive and broad-based glove standards developed by Committee D11. The standard provides glove manufacturers and the food industry with specific performance specifications, dimension and tolerance specifications, physical requirements and quality specifications for thin film, unlined polymer food service gloves.

COMMITTEE D24: INTERNATIONAL CARBON BLACK STANDARDS

A close partner in the activities of Committee D11 on Rubber is ASTM International [Committee D24 on Carbon Black](#). The primary reinforcing agent used in rubber compounds, carbon black plays an essential role in numerous products, the most common being automobile tires. By conducting heat away from the tread and belt area of the tire, carbon black reduces thermal damage, improving performance and increasing service life of the tires. Carbon black is also used in other consumer and industrial applications, adding strength and durability to liquid products such as printing inks, toners and paints as well as plastics and building products.

Committee D24 is the preeminent source for carbon black standards focused on composition, properties, classification, nomenclature, analysis and quality assurance. The committee's dedication to delivering standards that will be accepted around the world is reflected in its international membership. Committee D24 is comprised of technical experts from 11 worldwide carbon black industry leaders as well as manufacturers of globally recognized brand products.

D1765: THE AUTHORITATIVE LISTING OF CARBON BLACKS

One of Committee D24's most widely utilized standards is [D1765, Classification System for Carbon Blacks Used in Rubber Products](#). The system organizes rubber-grade carbon blacks

based on factors including the rate of cure of a typical rubber compound containing the black and the average surface area of the carbon black. D1765 currently lists 43 grades of carbon black, making it an authoritative reference for producers and users engaged in commercial transactions around the world.

D24 also offers test methods that provide valuable utility for evaluating carbon black properties such as structure and surface area or particle size and how these properties correlate best with rubber reinforcement. These methods are particularly useful in tire engineering applications, where selecting the right black for each component of the tire can impact performance. Standards such as ASTM [D2414, Test Method for Carbon Black — Oil Absorption Number \(OAN\)](#), and [D3493, Test Method for Carbon Black — Oil Absorption Number of Compressed Sample \(COAN\)](#), are useful in estimating structure of carbon black. Similarly, surface area properties are measured by standards such as ASTM [D1510, Test Method for Carbon Black — Iodine Adsorption Number](#).

Among the activities of Committee D24 is the recent formation of a new subcommittee: D24.66 on Environment, Health and Safety. D24.66 is developing standards that address health and safety related aspects of carbon black testing and manufacturing, and the group will provide assistance and guidance to other D24 subcommittees.

ASTM STANDARDS: SPURRING INNOVATION AND GROWTH IN THE GLOBAL PLASTICS INDUSTRY

Plastics play an indispensable role in the health, safety and overall quality of our daily lives. Whether used in product packaging, building and construction materials, sports equipment, furniture, electronic components, coatings or other applications, plastics impact our world in many ways. The plastics sector is also one of the largest manufacturing sectors in the world. According to Society of the Plastics Industry, plastics account for more than \$374 billion dollars in annual shipments in the United States alone.

The field of plastics is the focus of the standards efforts of one of ASTM International's largest, most active technical committees, [Committee D20 on Plastics](#). Approximately 800 members participate on one or more of 23 technical D20 subcommittees and have responsibility for more than 475 standards. D20 members represent 35 countries and the entire plastics industry supply chain, including raw material producers, finished product manufacturers and users.

D20 standards are instrumental in specifying, testing and assessing the physical, mechanical and chemical properties of a wide variety of materials and products that are made of plastic and its polymeric derivatives. Notable testing standards include [D638, Test Method for Tensile Properties of Plastics](#), which provides utility for plastics engineering design purposes as well as research and development. For evaluating thermal properties,

ASTM [D1525, Test Method for Vicat Softening Temperature of Plastics](#), offers data to compare the heat-softening qualities of thermoplastic materials.

Materials subcommittees cover numerous types of plastics used by diverse industries, including cellular, olefin and reinforced plastics, thermoplastic and thermosetting materials, and film and sheeting. Among the many widely referenced standards are ASTM [D3350, Specification for Polyethylene Plastics Pipe and Fittings Materials](#), and [D1693, Test Method for Environmental Stress-Cracking of Ethylene Plastics](#).

Plastic building products, such as plastic lumber and vinyl siding, is a growing area of product standardization activity within Committee D20. Subcommittee D20.20 on Plastic Products offers standards such as [D6108, Test Method for Compressive Properties of Plastic Lumber and Shapes](#), which is a valuable quality control reference for manufacturers and suppliers of plastic lumber products. Similar utility can be found in ASTM [D6662, Specification for Polyolefin-Based Plastic Lumber Decking Boards](#). D6662 covers performance requirements of polyolefin-based plastic lumber products including flexural properties, dimensional stability during thermal expansion, weatherability, fire properties and slip resistance.

D20.96: RESPONDING TO THE DEMAND FOR BIODEGRADABLE PLASTICS

Another notable D20 subcommittee is answering the growing call for biobased plastics, which are derived from renewable sources instead of fossil fuels. As issues of sustainability and environmental safety continue to emerge throughout the world, companies throughout the plastics industry are investing more in biobased and biodegradable plastics.

Subcommittee D20.96 on Environmentally Degradable Plastics and Biobased Products is responding to the need for consensus industry standards, compiling a growing set of specifications that addresses such topics as heat aging of plastics, anaerobic biodegradation of plastic materials, compostability of environmentally degradable plastics and other relevant issues. One of the committee's most widely used standards is [D6400, Specification for Compostable Plastics](#). D6400 covers plastics and products made from plastics that are designed to be composted in professionally managed municipal and industrial composting facilities. Also popular is ASTM [D5338, Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions](#), which helps in determining the rate and degree of aerobic biodegradability of plastic products when placed in a controlled composting process.

Complementing the activities of Subcommittee D20.96 are those of D20.95 on Recycled Plastics. D20.95 offers a valuable range of guidelines and practices focused on the handling, recycling and disposal of plastics. Committee members are currently working on a new standard that will help adapt the resin coding

system that is in use in the United States and abroad. The goal of the proposed standard is to facilitate more efficient recycling of post-consumer plastics.

D01: ENABLING QUALITY AND PERFORMANCE IN PAINTS AND COATINGS

Another long-standing ASTM committee that has had an enduring impact relevant to the chemical field is [Committee D01 on Paint and Related Coatings, Materials and Applications](#). Formed in 1902, D01 has grown to include 625 members from 36 countries. These technical experts deliver a voluminous set of more than 630 standards that are focused on the classification, sampling, preparation, components, application, analysis, quality assurance and end-use performance requirements of paints and coatings.

Material and component producers benefit from D01 standards that address such issues as the flash point and fire point of liquids, which are physical properties that may be used to define their flammability hazards. Subcommittee D01.22 on Flammability and Safety offers a wide array of standards in this area including [D1310, Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus](#), which helps measure and describe the properties of materials, products or assemblies in response to heat and flame.

Numerous D01 standards support paint manufacturers in the delivery of products that meet customers' expectations for quality and durability. For example, manufacturers often rely on ASTM [D1475, Test Method for Density of Liquid Coatings, Inks and Related Products](#), which covers the measurement of density of paints, inks, varnishes, lacquers and components. Scratch and mar resistance is also a primary quality control requirement of paints and coatings. A popular D01 protocol in this area is [D5178, Test Method for Mar Resistance of Organic Coatings](#), which offers useful guidance in differentiating the degree of mar-ring of coatings on substrates.

ADDRESSING THE RISKS OF VOLATILE ORGANIC COMPOUNDS

Committee D01 also has responded to growing concerns of indoor air contamination caused by volatile organic compound (VOC) emissions from paints and coatings. In the United States, regulations limiting VOC emissions rely on D01 standards for measuring total volatile content, exempt solvent content and paint or coating density. The U.S. Environmental Protection Agency references numerous D01 standards in regulations as acceptable test methods for regulatory compliance. Notable among these

is ASTM [D3960, Practice for Determining Volatile Organic Compound \(VOC\) Content of Paints and Related Coatings](#).

COMMITTEE F40: GUIDANCE FOR ENVIRONMENTAL REGULATION COMPLIANCE CHALLENGES

ASTM International [Committee F40 on Declarable Substances in Materials](#) was formed in 2005 to help guide global industries in the management and compliance requirements of hazardous materials. Regulations restricting materials used in finished goods pose challenges to today's manufacturing and supply chain infrastructure around the world. This legislation has placed restrictions on the content of certain hazardous substances in materials used in several industries, including packaging, vehicles, and electrical and electronic devices.

Committee F40 addresses issues related to the development of standards for the evaluation of materials and products relative to RoHS (Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), REACH (Registration, Evaluation, Authorization and Restriction of Chemicals), and similar regulations. One of the committee's important first standards is ASTM [F2617, Test Method for Identification and Quantification of Chromium, Bromine, Cadmium, Mercury and Lead in Polymeric Material Using Energy Dispersive X-Ray Spectrometry](#). F2617 describes a method for screening and quantifying the amount of elements in polymers that are subsequently used in the creation of consumer products.

Currently, F40 has several new standards under development, including two methods for the identification and quantification of lead in toys and other consumer products as well as a new guide for the identification of restricted substances in plastic and polymer materials.

Whether supporting raw material suppliers throughout the industry supply chain or helping manufacturers deliver the quality products we rely on every day, ASTM standards will continue to play a vital role in the chemical producing industry around the world.

In addition to standards in the chemical field relevant to raw materials and product manufacturing, ASTM International committees such as [E15 on Industrial and Specialty Chemicals](#), [E27 on Hazard Potential of Chemicals](#) and others develop standards for the physical analysis and testing of chemicals, which are not covered in this overview.

ASTM INTERNATIONAL TECHNICAL COMMITTEES IN THE CHEMICAL INDUSTRY

The ASTM technical committees highlighted in this piece include:

- ▶ D01 on Paint and Related Coatings, Materials and Applications
- ▶ D11 on Rubber
- ▶ D20 on Plastics
- ▶ D24 on Carbon Black
- ▶ F40 on Declarable Substances in Materials