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Helping our world work better

ASTM and the Metals Industry Long-Term Partners for Success

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ASTM International has been the standards development partner of the metals producing industry for more than a century. Today, thousands of ASTM standards cover ferrous and nonferrous metals, including steel, copper, aluminum and many others. These standards continue to contribute to important infrastructure projects and the development of countless industrial and consumer products, equipment and machines.

ASTM and the Metals Industry: Long-Term Partners for Success

ASTM was created in the late 1800s because of the U.S. railroad industry's need for steel standards. At the time, failures in railroad equipment jeopardized public safety and threatened to cripple commerce.

Recognizing the need for a standard test method used to manufacture steel railroad components, a concerned group of scientists and engineers formed ASTM and its first committee, A01, in 1898. Using a consensus-driven process that is still the hallmark of ASTM today, A01 members responded quickly, publishing A1 on Carbon Steel Tee Rails in 1901. This standard improved rail safety for the public and helped the industry grow in the following decades. Standard A1 has been revised numerous times and continues to meet industry needs today.

Committee A01 also began to address the need for specifications for steel used in buildings, machinery and infrastructure. For example, engineering companies used an early A01 specification when ordering steel for large bridge construction projects. The specification for carbon structural steel (A36/A36M) is still widely referenced for steel used in riveted, bolted and welded bridges, and general structural purposes.

These beginnings provided a foundation for the current success of Committee A01, which has a membership of 1,300+ industry leaders, including more than 200 international members. They work on more than two dozen subcommittees and have responsibility for about 500 standards.

A01 Standards: Building Structures

Standards from A01 support the manufacturing and testing of steel used to construct buildings, roads, bridges, railroads and more. The group's impact on infrastructure growth can be seen in standards such as the specification for zinc and epoxy dual-coated steel reinforcing bars (A1055/A1055M). A1055 supports the production of high performance, corrosion-resistant steel. This standard is particularly useful to transportation agencies in coastal environments.

A01 standards also respond to the changing needs of the steel industry. One example is the practice for portable hardness testing by the ultrasonic contact impedance method (A1038). The standard supports the use of portable equipment to test large steel pieces without removing them from the forging.

These and hundreds of other A01 standards are in ASTM's *Handbook of Comparative World Steel Standards* and *Passport to Steel*, a powerful online database that allows users to search for the latest data about more than 80,000 steels, including more than 15,000 coated steels.

Committee A05: Fighting Corrosion

Protection against rust and corrosion is critical to the life span of steels. Corrosion harms steel quality, ultimately contributing to product failure. For this reason, steel is protected through internal alloying, metallic coatings and other methods.


Improving the quality, usefulness and longevity of iron and steel products has long been the mission of Committee A05 on Metallic-Coated Iron and Steel Products (formed 1906). This world-class group has developed about 80 standards to help protect iron and steel products against corrosion through metallic as well as nonmetallic coatings.

Committee A05: Supporting Diverse Industries

Committee A05 standards help meet the need for high quality metallic-coated iron and steel products such as sheet, wire, tube and corrugated steel pipe, and structural and hardware components. These products are used in diverse industries such as building construction, auto manufacturing and electrical equipment.

A01 on Steel

Where it all began

A close-up photograph of a steel bridge joint. A large, hexagonal bolt is secured with a matching nut and a thick, circular washer. The bolt is positioned at the intersection of several heavy steel beams. The beams are painted a light grey color. The background shows more of the bridge's structure, including rivets and other beams, all in a similar light grey finish. The lighting is bright, creating strong highlights and shadows that emphasize the metallic texture and the industrial nature of the scene.

An early A01 specification helped engineering companies order steel for large bridge construction projects. Its successor standard, the specification for carbon structural steel (A36/A36M), is widely referenced for steel used in riveted, bolted and welded bridges, building construction and more.



Diverse

The metallic-coated iron and steel products covered by Committee A05 standards include sheet, wire, tube and corrugated steel pipe as well as structural and hardware components.

Notably, Committee A05 developed a coatings standard that provides an environmentally safe means of corrosion protection. The specification for zinc alloy thermo-diffusion coatings on steel fasteners, hardware and other products (A1059/A1059M), provides an eco-friendly way to replace toxic materials, such as cadmium and chromium compounds, used for corrosion protection.

A05 also supports work for lighter, more crash-resistant and fuel-efficient vehicles with a specification for coated steel sheet (complex phase, dual phase and transformation-induced plasticity, zinc-coated/galvanized or zinc-iron-alloy-coated/galvannealed by the hot-dip process, A1079). The specification will help further the use and understanding of the properties for various steel sheet classes and grades.

More Ferrous Metal Committees (A06 and A04)

ASTM's two other longstanding ferrous metals technical committees are A06 on Magnetic Properties and A04 on Iron Castings.

Committee A06 (formed in 1903) has contributed significantly to standards for the steel industry. A06 standards focus on electrical steels, permanent magnet materials and soft ferrites, all of which play vital roles in power generation, transmission, distribution and use.

Electrical steels are among the most important magnetic materials produced today. A notable A06 standard for procuring and delivering electrical steels is a specification for flat-rolled electrical steels for magnetic applications (A345). Additional standards cover specialty lamination steels and electrical iron and stainless steel for magnetic applications. A comprehensive set of test methods supports each of these specifications.

Powerful

Standards for electrical steels and permanent magnets are crucial for power generation and transmission.

Permanent magnet specifications are becoming more important with increased large-scale use of magnets in wind-based and other electricity-generating equipment. A specification for sintered ceramic ferrite permanent magnets (A1054) is the first in

a planned series of material specifications for these magnets. A test method for evaluating hygrothermal corrosion resistance of permanent magnet alloys (A1071/A1071M) also responds to a need expressed by this growing industry.

Committee A04 on Iron Castings is responsible for standards used in numerous infrastructure engineering, water distribution and industrial applications. For example, a specification for cast iron soil pipe and fittings (A74) covers products used in gravity flow plumbing; drain, waste and vent sanitation; and stormwater applications. A74 establishes standards for all aspects of these products. Iron castings in the industrial environment is the purpose of another A04 standard: the specification for malleable iron flanges, pipe fittings and valve parts for railroad, marine and other heavy duty service at temperatures up to 650°F (345°C) (A338).

B02: Supporting Nonferrous Metals

Nonferrous metals, including aluminum, copper, titanium, magnesium, tin, zinc, lead, nickel, gold and platinum are the focus of several other ASTM technical committees.

Committee B02 on Nonferrous Metals and Alloys (formed in 1902) has more than 200 members who oversee standards used in manufacturing electrical heating devices, electrical contacts and conductors, and thermo-sensitive elements in thermostats. Notably, B02 worked with A01 on Steel to address the needs of the railroad industry early in ASTM's history. Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys alone has jurisdiction over more than 100 standards that cover numerous alloys for a variety of applications.

The specification for zinc (B6) was the first B02 standard. With ongoing revisions, B6 remains widely used and today covers five grades of zinc: LME grade, special high grade, high grade, intermediate grade and prime western grade. Another notable B02 standard, the specification for prime western grade-recycled zinc (B960), covers zinc made from secondary materials such as drosses and skimmings.

Other popular B02 standards are the specification for solder metal (B32) used in non-electronic applications; and the specification for refined silver (B413), one of the many precious metal standards developed by Subcommittee B02.05 on Precious Metals and Electrical Contact Materials.

B05: Leading in Copper Standards

Committee B05 on Copper and Copper Alloys (formed in 1928) has responded to changes in how copper is manufactured and used, issuing and updating standards to meet the needs of the construction, auto, electronics and other industries. Today, almost 200 B05 members are responsible for 150 standards.

In the construction industry, B05 standards such as the specification for copper sheet and strip for building construction (B370) help establish requirements for copper used in roofing, flashing, gutters, downspouts and sheet metal work. Copper pipe and tube, used in a wide range of commercial and industrial areas, is another important area of this committee's work. For example, a specification for seamless copper pipe (B42) covers copper pipe for plumbing, boiler feed lines and more. In addition, a specification for seamless copper tube (B68) establishes requirements for the product used in refrigeration as well as in oil and gasoline lines where the interior surface of the tube must be free from scale and dirt.

Supporting Infrastructure

Committee A04 on Iron Castings is responsible for standards used in many infrastructure engineering, water distribution and industrial applications.



Cutting Edge

Committee B08 on Metallic and Inorganic Coatings develops standards that help industrialize metallic and inorganic coatings through electroplating, hot dipping, chemical conversion, porcelain enamel and ceramic metal coatings.

Since its founding,

B05 has responded to many changes in the way copper is manufactured and used, issuing new and revised standards to meet the needs of the construction, auto, electronics and other industries.

Better Aluminum Products with B07

Committee B07 on Light Metals and Alloys (formed in 1928) develops standards related to aluminum, magnesium and their alloys in both cast and wrought product forms. The committee is responsible for more than 80 standards that are maintained by about 160 industry experts.

Specifications and test methods developed by Committee B07 play an important role in infrastructure construction and operation. For example, the specification for corrugated aluminum pipe for sewers and drains (B745/B745M) covers pipe used in stormwater drainage, under drains and other sanitary and industrial waste conveyance systems.

B07 standards are used in many other industries. For example, the practice for ultrasonic inspection of aluminum-alloy wrought products for aerospace

applications (B594) helps define applicable quality levels. B07 has also developed a practice for sampling aluminum ingots, billets, castings and finished or semi-finished wrought aluminum products for compositional analysis (B985), which helps determine if the piece sampled meets alloy chemical composition limits.

Even More Metals Standards

Additional ASTM committees cover other aspects of metals.

Committee B01 on Electrical Conductors, for example, is responsible for standards for materials used in telecommunications, cable television and general electrical applications.

Evolving

The metals industry and its users can anticipate ongoing standards leadership from ASTM International.

Increasing electricity demands combined with a decreasing ability to expand have compelled electrical utilities to find ways to increase transmission efficiency within existing infrastructure. Energy efficiency is the focus of two B01 standards for steel core wire: the specification for extra-

high-strength and ultra-high-strength zinc-coated (galvanized) steel core wire for overhead electrical conductors (B957/B957M) and the specification for extra-high-strength and ultra-high-strength class A zinc-5% aluminum-mischmetal alloy-coated steel core wire for use in overhead electrical conductors (B958/B958M). These wire types support increased electrical transmission capacity with minimal investment, ultimately resulting in lower costs to the public.

In addition, Committee B08 on Metallic and Inorganic Coatings has more than 130 standards that help industrialize metallic and inorganic coatings through

electroplating, hot dipping, chemical conversion, porcelain enamel and ceramic metal coatings. Among these standards is a specification for electrodeposited coatings of zinc on iron and steel (B633). Zinc coatings are used to provide a sacrificial metal that prevents corrosion and protects the base metal. These coatings are used extensively on building hardware, fasteners and appliances, and for transportation and industrial applications.

Finally, Committee B09 on Metal Powders and Metal Powder Products is responsible for such standards as the specification for materials for copper base powder metallurgy structural parts (B823), and Committee B10 on Reactive and Refractory Metals and Alloys focuses on the development of specifications for reactive and refractory metals and their alloys, such as titanium, tungsten, zirconium and others.

As metals continue to evolve, the industry and its users can count on continued leadership from ASTM International and its members.

The B07 standards portfolio includes a practice for sampling aluminum to determine whether a piece meets chemical composition limits.



The ASTM technical committees highlighted in this piece include:

- A01 on Steel, Stainless Steel and Related Alloys
- A04 on Iron Castings
- A05 on Metallic-Coated Iron and Steel Products
- A06 on Magnetic Properties
- B01 on Electrical Conductors
- B02 on Nonferrous Metals and Alloys
- B05 on Copper and Copper Alloys
- B07 on Light Metals and Alloys
- B08 on Metallic and Inorganic Coatings
- B09 on Metal Powders and Metal Powder Products
- B10 on Reactive and Refractory Metals and Alloys

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Helping our world work better

Over 12,000 ASTM standards operate globally. Defined and set by us, they improve the lives of millions every day.

Combined with our innovative business services, they enhance performance and help everyone have confidence in the things they buy and use – from the toy in a child’s hand to the aircraft overhead.

Working across borders, disciplines and industries we harness the expertise of over 30,000 members to create consensus and improve performance in manufacturing and materials, products and processes, systems and services.

Understanding commercial needs and consumer priorities, we touch every part of everyday life: helping our world work better.

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