



ASTM and the
Metals Industry:

Partners in Long- Term Success

ASTM International has been the standards development partner of the metals producing industry for more than a century. Today, thousands of ASTM standards cover both ferrous and nonferrous metals, including steel, copper, aluminum and many others. ASTM metals standards continue to make a contribution to important infrastructure construction projects as well as to the development and production of countless industrial and consumer items, equipment and machines.



WHERE IT ALL STARTED: A01 ON STEEL

The role of ASTM standards in the field of metals dates back to the start of ASTM International itself. In fact, ASTM was formed more than 110 years ago because of the railroad industry's need for steel standards at the end of the 19th century. At the time, failures in railroad equipment jeopardized public safety and posed the threat of bringing commerce to a standstill, potentially crippling the burgeoning rail industry. Recognizing the need for a standardized test method for steel used to manufacture railroad components, a concerned group of scientists and engineers formed ASTM and its founding committee, A01 on Steel, in 1898.

Utilizing the consensus process that is still the hallmark of ASTM today, the early A01 members responded quickly to the needs of industry and the public, publishing its first standard — **A1 on Carbon Steel Tee Rails** — in 1901. ASTM standard A1 ultimately improved rail safety for the public and helped industry growth in the following decades. In a testament to ASTM's longevity and its commitment to continuous updating of its consensus standards, standard A1 has been through numerous revisions and still plays an active role today in meeting industry needs.

Committee A01 soon began to address the need for specifications for steel used in buildings, machinery and bridges. Another of its early standards was A7, Specification for Structural Steel for Bridges, also released in the early part of the century. Engineering companies that ordered steel for large bridge construction projects used A7 for many years. Today, A7's successor standard — **A36/A36M, Specification for Carbon Structural Steel** — is still widely referenced for steel used in riveted, bolted or welded construction of bridges and buildings, and for general structural purposes.



WORLD LEADER IN THE DEVELOPMENT OF STEEL STANDARDS

These beginnings provided a foundation for the current success of ASTM Committee A01. The committee, now known as **A01 on Steel, Stainless Steel and Related Alloys**, has a membership of 1,000 industry professionals and experts, including more than 200 international participants. These members work on one or more of A01's 22 standards-writing subcommittees and have responsibility for more than 500 material specifications, test methods and practices.

A01 STANDARDS: HELPING BUILD THE WORLD'S INFRASTRUCTURE

Standards from A01 support the manufacturing and testing of steel used to construct buildings, roads, bridges, railroads and more. Committee A01's impact on infrastructure construction is evidenced by standards such as **A1055/A1055M, Specification for Zinc and Epoxy Dual-Coated Steel Reinforcing Bars**, released in 2008. A1055 supports the production of high performance, corrosion-resistant steel. This ASTM standard is particularly beneficial to state departments of transportation that require reinforcing steel bars in coastal environments.

Other A01 standards reflect the committee's ability to respond to the changing needs of the steel industry. One notable example is ASTM **A1038, Practice for Portable Hardness Testing by the Ultrasonic Contact Impedance Method**, which helps facilitate better use of portable equipment for testing large steel pieces without the need for their removal from the forging.

These and hundreds of other A01 standards are contained in such ASTM products as the popular **Handbook of Comparative World Steel Standards** and "Passport to Steel," a powerful online database that enables users to search for the latest data about more than 80,000 steels, including more than 15,000 coated steels, covered by standards from developers around the world.

COMMITTEE A05: FIGHTING CORROSION

Critical to the life span of steel and its continued widespread use in various applications and products is protection against rust and corrosion. Over time, corrosion can harm steel quality, ultimately contributing to product failure. For this reason, steel is protected by a variety of methods ranging from internal alloying to metallic coatings.

Improving the quality, usefulness and longevity of iron and steel products has long been the mission of ASTM **Committee A05 on Metallic-Coated Iron and Steel Products**. Formed in 1906, A05 has contributed more than 70 standards to help protect iron and steel products against corrosion by the use of metallic as well as nonmetallic coatings used in supplemental protection.

SUPPORTING DIVERSE INDUSTRIES

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. These products are

used in a wide range of industries such as building construction, automobile manufacturing and electrical equipment. These and other end uses require high quality coated iron and steel products, many aspects of which are addressed in A05 standards.

With a heightened global focus on the environment, Committee A05 recently responded with the release of a new coatings standard that provides an environmentally safe means of corrosion protection. **A1059/A1059M, Specification for Zinc Alloy Thermo-Diffusion Coatings (TDC) on Steel Fasteners, Hardware and Other Products**, provides an eco-friendly way to replace toxic materials, such as cadmium and chromium compounds, used for corrosion protection.

Another notable A05 standard also released in 2008 is **A1057/A1057M, Specification for Steel, Structural Tubing, Cold Formed, Welded, Carbon, Zinc-Coated (Galvanized) by the Hot-Dip Process**. A1057 addresses the galvanizing process across numerous industries and is beneficial to original equipment manufacturers, structural and mechanical engineers, federal and state agencies, and industry associations.

MORE FERROUS METAL COMMITTEES

ASTM International's two other longstanding technical committees in the field of ferrous metals are **A06 on Magnetic Properties** and **A04 on Iron Castings**. Committee A06, formed in 1903, has made significant contributions to standards development in the steel industry, particularly for electrical steels. Standards developed by Committee A06 focus on electrical steels, permanent magnet materials and soft ferrites, all of which play vital roles in the generation, transmission, distribution and use of electrical power.

Electrical steels are among the most important magnetic materials produced today. A notable A06 materials standard used in the procurement and delivery of electrical steels is **A345, Specification for Flat-Rolled Electrical Steels for Magnetic Applications**. Additional material standards cover lamination steels used in specialty applications, and electrical iron and stainless steel for magnetic applications, among many others. A comprehensive set of test methods supports each of these specifications.

Permanent magnet specifications are assuming new importance with increased large-scale use of magnets in wind-based and other novel electricity generating equipment. Standard **A1054, Specification for Sintered Ceramic Ferrite Permanent Magnets**, is the first in a planned series of material specifications for these magnets. The recently approved **A1071/A1071M, Test Method for Evaluating Hygrothermal Corrosion Resistance of Permanent Magnet Alloys**, also responds to a need expressed by the permanent magnet industry.

ASTM **Committee A04 on Iron Castings** is responsible for standards that play a significant role in numerous infrastructure engineering, water distribution and industrial applications. For example, **A74, Specification for Cast Iron Soil Pipe and Fittings**, covers cast iron soil pipe and fittings for use in gravity flow plumbing; drain, waste and vent sanitary; and storm water applications. A74 establishes standards covering material,

manufacture, mechanical and chemical properties, coating, test methods, inspection, certification, product markings, dimensions and dimensional tolerances for extra heavy and service cast iron soil pipe and fittings. Iron casting use in the industrial environment is the focus of another A04 standard, **A338, Specification for Malleable Iron Flanges, Pipe Fittings and Valve Parts for use in Railroad, Marine and other Heavy Duty Service at Temperatures Up to 650°F (345°C)**.

ASTM COMMITTEES COVER THE WORLD OF NONFERROUS METALS

The field of nonferrous metals, including aluminum, copper, titanium, magnesium, tin, zinc, lead, nickel, gold, platinum and more are the focus of several other ASTM technical committees. One such group is **Committee B02 on Nonferrous Metals and Alloys**, which was formed in 1902 and joined Committee A01 in addressing the standardization needs of the railroad industry. Today, Committee B02 has a membership of about 200 professionals who oversee more than 208 standards and test methods pertaining to nonferrous metals and alloys used in such applications as the manufacture of electrical heating devices, electrical contacts and conductors, and thermo-sensitive elements in thermostats. Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys alone has jurisdiction over more than 100 standards that began with a specification for nickel. B02.07 standards now cover many new alloys used in a wide variety of applications.

ASTM **B6, Specification for Zinc**, was the first standard released by Committee B02. Having gone through numerous revisions, B6 remains widely referenced and today covers five grades of zinc: LME grade, special high grade, high grade, intermediate grade and prime western grade. Recycled zinc is the focus of another notable B02 standard: **B960, Specification for Prime Western Grade-Recycled (PWG-R) Zinc**. B960 covers zinc made by recycling zinc secondary materials such as drosses and skimmings.

Other popular B02 standards are **B32, Specification for Solder Metal**, which covers solder metal alloys used in non-electronic applications; and **B413, Specification for Refined Silver**, one of the many precious metal standards developed by Subcommittee B02.05 on Precious Metals and Electrical Contact Materials.

COMMITTEE B05: LEADING THE WAY IN COPPER STANDARDS

ASTM **Committee B05 on Copper and Copper Alloys**, which has roots in Committee B02, organized in 1928. Since its founding, B05 has responded to numerous changes in the way copper is manufactured and used, issuing new standards and updating existing ones to meet the needs of diverse industries, including construction, automotive, electronics and many others.

In the construction industry, standards from Committee B05, such as ASTM **B370, Specification for Copper Sheet and Strip for Building Construction**, help establish the requirements for copper used in roofing, flashing, gutters, downspouts and general sheet metal work in building construction. Copper pipe and

tube, used in a wide range of commercial and industrial areas, is another important focus of Committee B05's standards writing activities. For example, ASTM **B42, Specification for Seamless Copper Pipe, Standard Sizes**, covers copper pipe for plumbing, boiler feed lines and other similar purposes, and **B68, Specification for Seamless Copper Tube, Bright Annealed**, establishes the requirements for seamless copper tube suitable for refrigeration, and oil and gasoline lines requiring tube with an interior surface essentially free from scale and dirt.

In 2008, Committee B05 established a task group focused on the antimicrobial applications of copper and copper alloys. The task group was formed following the U.S. Environmental Protection Agency's announcement of its registration of copper alloys as antimicrobial materials capable of killing specific disease-causing bacteria, including methicillin-resistant *Staphylococcus aureus*, or MRSA. B05 members actively participate in related standards work initiated in Subcommittee E35.15 on Antimicrobial Agents, part of Committee E35 on Pesticides, Antimicrobials, and Alternative Control Agents, because of the EPA action.

BETTER ALUMINUM PRODUCTS WITH B07

Committee B07 on Light Metals and Alloys develops standards related to aluminum, magnesium and their alloys in both cast and wrought product forms. Founded in 1928, Committee B07 is responsible for more than 85 standards that are maintained by approximately 160 industry professionals.

Specifications and test methods developed by Committee B07 play an important role in areas such as municipal infrastructure construction and operation. Here, standards like **B745/B745M, Specification for Corrugated Aluminum Pipe for Sewers and Drains**, cover corrugated aluminum pipe intended for use in storm water drainage, under-drains and other sanitary and industrial waste conveyance systems. Other applications of B07 standards can be found in diverse industries, for example, aerospace, where documents such as **B594, Practice for Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications**, help define applicable quality levels of aluminum-alloy wrought products for aerospace applications.

EVEN MORE METALS STANDARDS

Not to be overlooked are the contributions of several additional ASTM committees that cover various other aspects of metals.

Important among these contributions are the standards developed by **Committee B01 on Electrical Conductors**. Test methods and specifications developed and maintained by Committee B01 cover the use of electrical conductor materials for telecommunications, cable television and general electrical applications, among others.

Energy efficiency is the focus of two new B01 standards released in 2008: **B957, Specification for Extra-High-Strength and Ultra-High-Strength Zinc-Coated (Galvanized) Steel Core Wire for Overhead Electrical Conductors**, and **B958, 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**. Increasing demands for electricity, combined with a decreasing availability of system expansion resources, has created the need for electrical utilities to find ways to make the most of existing infrastructure in gaining electrical transmission efficiency. The development of new steel core wire, covered in B957 and B958, allows utilities and transmission cable designers more flexibility in increasing electrical transmission capacity with minimal investment, ultimately resulting in lower costs to the general public.

ASTM Committee B08 on Metallic and Inorganic Coatings develops standards pertaining to the effective industrialization of metallic and inorganic coatings, including processes such as electroplating, hot dipping, chemical conversion, porcelain enamel and ceramic metal coatings. Among the standards developed by B08's 10 technical subcommittees are ASTM **B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel**. 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, highways, fasteners and appliances, and for transportation and industrial applications.

Rounding out ASTM's metals technical committees is **B09 on Metal Powders and Metal Powder Products**, which is responsible for such standards as **B823, Specification for Materials for Copper Base Powder Metallurgy (PM) Structural Parts**, and **Committee B10 on Reactive and Refractory Metals and Alloys**, which focuses on the development of test methods and practices pertaining to reactive and refractory metals and their alloys, such as titanium, tungsten, zirconium and others.

As the metals fields continue to evolve, the industry and its users can look forward to ongoing standards leadership from ASTM International.

ASTM INTERNATIONAL TECHNICAL COMMITTEES ON METALS

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