



The HANDBOOK of STANDARDIZATION



A Guide to Understanding
Standards Development Today





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Standards are a fundamental part of our daily lives for a multitude of reasons. They open channels of communication and commerce, promote understanding of products, ensure compatibility, enable mass production and, most importantly, they form the basis of achieving better health and safety and a higher quality of life.

We are literally surrounded by standards. The buildings we live in, the airplanes we fly on, the roads we travel, the computers we operate, even the clothes we wear are all manufactured in accordance with standards. All these things work smoothly and efficiently if the standards to which they were manufactured were properly developed and applied.

this booklet has been developed to provide a better understanding of how and why standards are initiated and used. It explains how standards are developed by the private and public sectors, and gives an overview of the major organizations involved with standards. When examples are given to illustrate a point, ASTM International will be cited. ASTM International is one of the world's largest and most diverse standards developing organizations (SDOs). ■



What Is a Standard?

A standard is a common language that promotes the flow of goods between buyer and seller and protects the general welfare. One example comes from building design. When architects design a building, they stipulate exactly what steel is required by referencing a standard specification on the drawing. They may, for example, refer to “ASTM A 36,” which is a specification for structural steel. This one document is the simplest and best possible way to communicate to a contractor the type of steel desired in terms of composition, strength, and quality. ASTM Specification A 36 is a four-page publication describing the requirements that the steel must meet. Using standards, architects do not have to consult volumes of reference books and expend reams of paper and costly hours describing steel thickness, tensile strength, and other characteristics.

Thousands of such standards are readily available, and thanks to the common language of standardization, buyer and seller have little difficulty communicating. ■

Consumer Health and Safety: Made Possible by ASTM Standards

ASTM standards are all around us each and every day from the water we drink, the roads we drive on, the buildings we live and work in, and the products we use. For countless ASTM standards, the principal focus is helping to facilitate and protect the health and safety of consumers. Many new standards activities within ASTM International bring this longstanding objective to the forefront.

How Do Voluntary Standards Get Written?

A full consensus standard is developed by a cross-section of stakeholders with an interest in its use. When there is a need for new standards, requests can come from trade associations, government agencies, and professional societies that do not create their own standards, or manufacturers, consumer groups, and even individuals. The exact process of forming technical committees and developing and approving the draft standard varies from SDO to SDO.

Generally, standards-writing committees are groups of experts who volunteer their time in draft-development sessions. They are seeking the mutual benefit of all concerned through consensus. As an illustration of how SDOs develop standards, we'll follow the ASTM system.

The diversity of ASTM International's membership is perhaps its most distinct quality and is a large part of what distinguishes the ASTM development and approval process from other organizations.

Developing standards at ASTM means working alongside competitors, customers, regulatory bodies, and other stakeholders from around the world to debate technical issues, share research data, and exchange knowledge. Through the ASTM International process, these stakeholders learn to capitalize on their diversity and work in partnership with each other to resolve their differences during the standards development process rather than after. Coupled with this cooperative system of standards development is the ensuring of fairness through:

- 1) a required balance of interest between producers, users, and general interest members and
- 2) a voting process that ensures due process.

The ASTM process transcends what entities can do individually because it bridges gaps of technology, combines resources, and overcomes competition. The result is a product of the highest credibility, integrity, and marketplace acceptance.

To better help the millions of people living with hearing loss, ASTM Committee F04 on Medical and Surgical Materials and Devices is working to advance the technology of implantable hearing devices through the efforts of a new subcommittee. Activities addressing safety issues can be found in the work of ASTM Committee F24 on Amusement Rides and Devices. For over 25 years, F24 has created numerous amusement ride-related safety standards and has focused recent efforts on standards for the popular areas of water rides and bungee units.



The work of many ASTM committees helps create greater health and safety for our children through myriad product-related standards. As new areas of concern arise, ASTM committees such as Committee F15 on Consumer Products are quick to address the need for new standards activities. One example is the efforts of ASTM Subcommittee F15.29 on Playground Equipment for Public Use, which recently released an update to Specification F 1487, Consumer Safety Performance Specification for Playground Equipment for Public Use. Specification F 1487 is an integral part of the National Playground Safety Institute's playground inspector certification program. F15 also has recently launched new standards for pool and spa safety covers, permanent barrier fencing, and pool alarms, better protecting children in their use of residential pools. ■

Partnership for a Better Environment: ASTM Responds to the Call

Promoting a cleaner and safer environment has been an enduring focus of numerous ASTM technical committees. Through the work of these committees, ASTM standards contribute to cleaner air and water, improved waste management and recycling, pesticide safety, hazardous substances and oil spill response, and many other critical areas.

As new technologies increasingly play a role in the ongoing health of our environment, ASTM International made a valuable new contribution to environmental safety by developing a new standard that defines pure biodiesel, an alternative fuel.

The ASTM standard, D 6751, aids manufacturers in their production of biodiesel, as well as providing users with a full consensus standard that they can reference in the sale or purchase of the alternative fuel. ■



Understanding the hierarchy within ASTM International is integral to appreciating the value of the ASTM standards development and approval process. The hierarchy comprises three basic levels: main committees, subcommittees, and task groups. Task groups perform most of the “leg-work” and research that forms the basis of draft standards. Once the group completes its work, it forwards these drafts through the hierarchy for review and voting. The standard must gain subcommittee, main committee, and Society approval before becoming an official ASTM International standard.

At each level, voting requirements are enforced to ensure fairness. When the draft has been reviewed and accepted at all levels, the draft becomes an ASTM standard and is published. Depending upon the need for the standard, drafting and approval can occur in a few months, a year, or more. ■

The U.S. Standards System

The United States is very different from other countries of the world, where usually one organization is designated as the major standards developer and that organization is closely tied to, if not a part of, the government. There are many organizations that comprise the U.S. standardization system, including government and non-government organizations.

In the United States, there are essentially two broad categories of standards with regard to regulation—mandatory and voluntary.

Mandatory standards are set by government and can be either procurement or regulatory standards. A procurement standard sets out the requirements that must be met by government suppliers; regulatory standards may set health, safety, environmental, or other criteria.



Voluntary standards—In the United States, the voluntary standards development system is called “voluntary” for two reasons. First, participation in the system is voluntary. Second, the standards produced usually are intended for voluntary use. Voluntary consensus standards are developed through the participation of all interested stakeholders, including producers, users, consumers, and representatives of government and academia.

In the United States, the distinction between voluntary and mandatory standards is not clear cut. Often, government standards developers refer in their regulations to privately developed standards, and in that reference give the standard the force of federal, state, or local law.

Building codes, for example, reference hundreds of standards developed by voluntary standards organizations. Since building codes are the province of government, the referenced standards have the force of law and must be adhered to. Regulatory agencies such as the Federal Aviation Administration, Environmental Protection Agency, the Food and Drug Administration, and the Department of Housing and Urban Development also reference hundreds, if not thousands of voluntary consensus standards in lieu of developing their own documents. These too, have the force of law once they are referenced in a government regulation. In the wake of the U.S. National Technology Transfer and Advancement Act (Public Law 104-113), which requires government agencies to use privately developed standards whenever it is at all possible, this practice is on the increase, saving taxpayers millions of dollars in formerly duplicative standards development efforts. ■

Timely Standards Development: Powered By Technology

In today’s dynamic, fast-moving global business environment, standardization requirements change at an equally rapid pace. To best serve the needs of the marketplace, standards development processes must be flexible and open, while enabling work to be performed in a quick and efficient manner.

Technology is a vital asset to ensuring that much-needed standards can be developed and distributed to the marketplace in a timely manner. Through Internet-based Standards Development Forums, for example, ASTM International standards are drafted, revised, and balloted electronically. This allows for work to be accomplished between meetings, enables 24/7 access to the process worldwide, and encourages even broader participation into ASTM’s open standards development process.

Adding further efficiency and transparency to the standards development process, ASTM’s Work Item Registration system allows users to register and track draft standards and revisions before and during their balloting stage. Further responding to the needs of industry, ASTM International speeds the standards development process with an advanced operational infrastructure that includes such electronic tools as online balloting, e-minutes of meetings, electronic templates, state-of-the-art distribution methods, and virtual meetings. ■

What Kinds of Standards Are There?

There are at least five kinds of standards, based on the degree of consensus needed for their development and use.

COMPANY STANDARD:

Consensus among the employees of an organization.

CONSORTIUM STANDARD:

Consensus among a small group of organizations, usually like-minded companies formed to undertake an activity that is beyond the resources of any one member. An example of a consortium is the United States Council for Automotive Research's (USCAR's) Strategic Standardization Board, which reflects USCAR's commitment to managing standards issues with regard to competitiveness.

INDUSTRY STANDARD:

Consensus among the many companies within an association or professional society. An example is a standard developed by the American Petroleum Institute (API), a trade association that is comprised of many different petroleum companies.



GOVERNMENT STANDARD:

May reflect many degrees of consensus. Some are written by individuals in government agencies, many are now being developed in the private sector and then adopted by reference as mandatory standards. Standards incorporated into federal regulations under the jurisdiction of the Environmental Protection Agency (EPA) or the Occupational Safety and Health Administration (OSHA) are examples of government standards.



VOLUNTARY CONSENSUS STANDARD:

Consensus is developed by representatives of all sectors that have an interest in the use of the standard. These sectors can include producers, users, and those having a general interest (representatives of government and academia), as well as ultimate consumers. Consensus standards, with their broad input, are considered by many as the most technically sound and most credible documents. They are often used as the basis for commercial and regulatory action. Examples of voluntary consensus standards developing organizations include ASTM International, the American Society of Mechanical Engineers (ASME International), and the National Fire Protection Association (NFPA International). ■



Consensus Standards and the Federal Government: The FAA Turns to ASTM

For many years, ASTM International has been the standards development organization (SDO) of choice where government and industry cooperate in the development of consensus standards. As new ASTM technical committees form, the ties between ASTM and the U.S. Federal Government grow stronger and broader. This is evidenced by the role of key agencies on new ASTM committees, such as the U.S. Department of Homeland Security's involvement on Committee E54 on Homeland Security Applications; and the U.S. Food and Drug Administration's leadership in Committee E55 on Pharmaceutical Application of Process Analytical Technology.

ASTM's longstanding partnership with government stakeholders broke new ground in 2005 with the U.S. Federal Aviation Administration's (FAA's) acceptance of the standards developed by ASTM International Committee F37 on Light Sport Aircraft.

This marked the first time that the FAA has adopted industry-developed standards related to aircraft design, manufacturing, and maintenance, instead of federal regulatory standards.

F37 organized in 2002 in response to the FAA's call for the recreational aircraft industry to develop consensus standards; the committee includes active FAA representation as well as all interested stakeholders — light sport aircraft and parts manufacturers, instructors, user groups, pilots, and regulatory representatives. Using ASTM's flexible infrastructure for consensus standards development, F37 members were able to accelerate their standards writing activities and respond efficiently and effectively to marketplace needs.

F37 has a portfolio of 26 approved standards, all of which are referenced by the FAA. ■

THE FOLLOWING IS A BREAKDOWN OF SOME OF THE MAJOR PLAYERS IN THE U.S. STANDARDS DEVELOPMENT SYSTEM.

ANSI—The American National Standards Institute (ANSI) is as close as the United States comes to a central voice for standards development. A not-for-profit, non-governmental organization headquartered in Washington, D.C., ANSI does not develop standards; its major role is to serve as the U.S. member body to the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), coordinating the U.S. position in the development of ISO and IEC standards. In addition, ANSI accredits standards developing organizations according to their consensus processes and accredits standards developed by SDOs as American National Standards. (www.ansi.org)

NIST—The National Institute of Standards and Technology (NIST) has the explicit mission of assisting U.S. industry in advancing its performance in the development and application of technology.

Today, NIST is the U.S. government agency with leading expertise in the area of technology standards and industry standardization issues and its staff is actively involved in voluntary consensus standards development activities. (www.nist.gov)

GOVERNMENT AGENCIES—As mentioned above, the U.S. government is also a standards developer. While the National Technology Transfer and Advancement Act encourages less actual development of standards within government agencies, government employees participate in the development and referencing of standards developed in the private sector. U.S. government agencies that rely on standards run the gamut from the Department of Agriculture, through the General Services Administration, to the Department of Veterans Affairs.

OTHER STANDARDS DEVELOPING ORGANIZATIONS—Other types of SDOs in the United States include professional societies, industry associations, membership organizations, and consortia. ■



What Is an International Standard?

An international standard is one that is accepted in more than one country.

Acceptance means that the standard can be used to comply with technical regulations or to spell out the terms of contracts. International standards are in great demand by exporters whose objective is to sell in multiple markets. Using one standard in multiple markets is cheaper, more efficient, and makes international trade significantly easier and simpler. ■



Keeping Pace with the Changing World: Dynamic New Standards Initiatives

Traditional industries such as steel, petroleum, building materials and many others have long called ASTM International their home for standards development. Using the proven ASTM standards development system, technical committees such as A01 on Steel, Stainless Steel, and Related Alloys, D02 on Petroleum Products and Lubricants, and E05 on Fire Standards have created standards that have impacted our lives for over a century. Today, many of these same committees continue to break new ground in their areas of expertise, for example D02's standards work in the area of alternative fuels, like biodiesel. The work of these enduring ASTM technical committees has also provided the foundation and vision for new, dynamic standards initiatives within ASTM International.

Recognizing the critical role of standards in the commercial advancement of new technologies, diverse groups of stakeholders have chosen ASTM International to help create the standards that will propel their industry forward. In the world of science and discovery, new ASTM Committee E56 on Nanotechnology is creating standards that will drive the commercialization of this revolutionary technology. Another new ASTM committee, F41 on Unmanned Undersea Vehicle (UUV) Systems, is helping to define the next generation of UUV technology, opening the door to a new era of oceanographic exploration and commercial and military applications. And like many other ASTM technical committees concerned with environmental issues, Committee F40 on Declarable Substances in Materials is developing consensus standards aimed at improving the global environment and addressing compliance-related concerns. ■

How Are International Standards Developed?

International standards are developed in much the same way as national standards, except that the consensus is considerably wider, i.e., the standard contains technologies that have been developed by experts from more than one country or background. There is one exception to this condition, and that is when the standard is unique or so technically superior that it has no peer. This type of standard may enjoy international acceptance no matter how it is developed.

In most cases, however, there are two basic ways of developing an international standard. One is by national delegation, that is, a country will appoint an official delegation to represent its interests in the standards development process. In the International

Organization for Standardization (ISO) and in the International Electrotechnical Commission (IEC), international standards are developed in technical committees by official delegations and each country is allotted one vote. The other process, which has been adopted by ASTM International, uses individual experts who come from countries around the globe. They may represent companies, consumers, universities, or governments. ASTM's international standards are developed in the same way as its other standards. The process is described in the section titled "How Do Voluntary Standards Get Written?" Over 125 countries are represented in ASTM International, and thousands of ASTM standards are accepted and used in countries all over the world. ■

International Standards and Fair Trade

The World Trade Organization (WTO) has recognized the important role of standards in trade. The WTO Agreement on Technical Barriers to Trade (TBT) encourages the use of international standards in technical regulations. In this agreement, international standards are seen as deterrents to the misuse of standards in trade, i.e., the use of standards to deny a product entry into a market, or to favor a national product over an exported one. To clarify what constitutes an international standard that can serve this purpose, the TBT Committee has agreed upon a set of

principles to be used in the development process. The Committee has stated, for example, that the development process must be open and transparent. The development process must also be conducted with impartiality and consensus, relevance and coherence, which means that technical experts must be mindful of existing standards and resist standards developing projects that might be duplicative or overlapping. The principles also include a provision that encourages SDOs to provide aid to developing countries. ASTM International meets all these requirements. ■





ASTM Standards in Developing Countries

ASTM International has a presence in many developing countries. ASTM has signed memoranda of understanding with the national standards organizations of these countries, many of them government agencies. Through the use of standards provided by ASTM International, the citizens of these countries can experience an increase in quality of life and improve their trade opportunities. Not only do MOUs transfer technology to where it is needed most, but they also establish and embed ASTM standards in standards infrastructures and technical regulations in markets that were formerly difficult or impossible to penetrate. ■

International Standards that Have No Peer

There are standards that are unique, or so technically superior that they have no peers. Such peerless technology is contained, for example, in the Internet standards, which were developed by small groups of technical experts. Other examples can be found in the ASTM aviation fuel standards and the ASTM carbon black standards, which are used in the manufacture of tires. These standards represent the definitive technology in their fields and are accepted wherever in the world these products are manufactured and used. A unique set of standards is the ISO 9000 quality management standards series and its derivatives. Frequently called out in contracts, these management standards may also appear in regulations. As these examples illustrate, there are multiple paths to the development of international standards. ■





Standards Without Borders: ASTM and Global Standards Development

From its inception, ASTM's method of developing standards has been based on consensus without borders. ASTM's process ensures that interested individuals and organizations representing academia, industry, product users, and governments all have an equal vote in determining a standard's content. Participation in the development of ASTM standards is open to all interested parties from anywhere around the world. This "open door" approach to standards development has led to the representation of more than 125 countries in ASTM's membership of 30,000 technical experts.

For companies competing in multiple global markets, standards are also a key component of their international business strategy, facilitating market access and product acceptance at home and abroad. Working in a consensus process that is free of geographical and political boundaries, ASTM International members deliver standards that truly connect to the global marketplace.

This high degree of market relevancy is reflected by the fact that more than 40 percent of ASTM's standards are distributed outside of the United States, and over 2500 ASTM standards have been adopted as the basis of national standards or are referenced in regulations in countries outside the U.S. ■



The Standards Incentive

We have seen how the impetus for standards development can come from many different sources, but what are the incentives that bring these groups into the standards arena?

Standards are seldom the products of altruism. Individuals and organizations become involved in standards writing for very specific reasons. Among them are:

The Economic Incentive—Both producers and consumers reap the benefits of standards, which are the ability to manufacture and purchase more economically through mass production, to lower inventories by eliminating unnecessary grades, and to improve quality control.

The Public Service Incentive—Virtually every government agency is active in the standards forum because each has an obligation to act in the public interest. In the development of standards, representatives of government often serve as the spokesmen or voting voice of the consumer.

The Individual Incentive—Participation on a standards committee provides an outstanding opportunity for individual professional growth. Participants become more proficient in their fields and develop broader understanding, which often leads to wide recognition among their peers.

The Shared Work Incentive—Simply stated, it is far easier to arrive at solutions when the knowledge and practical skills of many are brought to bear on a problem. This is precisely what happens at the standards table—the participants lend their collective expertise to producing meaningful documents and at the same time, by their participation, they preclude the development of standards that would serve only narrow interests. Inevitably, the final product is far greater than the sum of its parts.

Standards provide a way to speak an international language that ensures product consistency and compatibility, enhanced competition, technology diffusion, and the public welfare across international borders. Standards development and use, therefore, is an important subject to learn about and master as everyone, from small business entrepreneur to CEO, from engineer to government official, grapples with the broad bottom-line implications of standards. ■





ABOUT ASTM INTERNATIONAL

Established in 1898, ASTM International provides a global forum for the development and publication of international voluntary consensus standards for materials, products, systems and services. Known for their high technical quality and market relevance, ASTM standards are used in research and development, product testing, and quality systems. ASTM standards are a critical element of the information infrastructure that guides manufacturing and trade in the global economy.

ACCESS TO STANDARDS

An online index of 12,000 ASTM standards enables you to locate ASTM standards in some 140 various industry areas. Available on the ASTM Web site (www.astm.org), the online index facilitates searches by keyword or standard number, and viewers can access the titles and scopes of all ASTM standards. The full text of any ASTM standard is available electronically or in print via the web site or through Customer Service at ASTM International (610/832-9585).

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