Valve Standards: United States and the World – *The Things That Unite Us, Outweigh The Things That Divide Us*

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Definitions

- Code: A universally accepted, agreed upon, or established means of determining what something should be. Monitored for compliance by an authoritative agency that can be adopted by legal jurisdiction and made into a law.
- Standard: provides requirements and specifications to ensure that products, such as valves, are fit for their purpose. A standard is not a mandatory specification but a reference which is applied or not by the manufacturer or asked by the customer
- Recommended practice: an exact statement which is recognized as desirable in the interest of safety, regularity, or efficiency by an organization or customers. It provides for voluntary compliance

Purpose of Standards

- Three (3) primary purposes

1. Safety
2. Consistency / Interchangeability
3. Quality

Safety

- Protection of human life
  - To insure the safety of the operators of the products in field applications

- Protection of the environment
  - To afford users the assurance that products they purchase will provide minimum equivalent levels of performance such as fugitive emissions

- Protection of property
  - To insure the safety of the facilities that use products in field applications. Prevent failures

Safety

- **Without Standards deadly accidents can happen**

February 28, 1844 – Explosion of the 12” smooth bore cannon *“Peacemaker”* onboard the USS Princeton

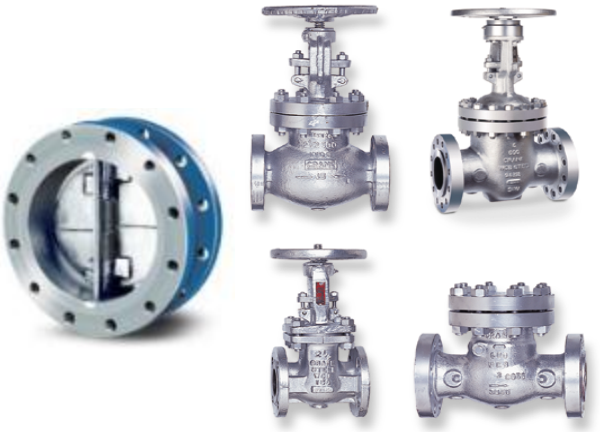
Manufactured by Hogg and Delamater of New York City, designed by Captain Robert Stockton, this cannon was a muzzle loader machined from a thick wall, wrought iron casting. During a demonstration firing for President John Tyler, his Cabinet, and 400 other guests, the cannon’s breech exploded, killing Secretary of State Abel Upshur, Secretary of the Navy Thomas Gilmer, and seven others. Twenty others were wounded. President Tyler barely escaped injury. The cannon’s design was based on personal experience, not on existing standards of the day.

Consistency

- Interchangeability of components
  - To insure that the various components of a system will fit together in the field
  - To insure interchangeability between different manufacturers of the same assembly, especially in the field

Each assembly dimensionally is the same as another

- Quality
  - Long, reliable operation / Extended life
  - To afford users the assurance that products they purchase will provide minimum equivalent levels of performance and also in regard to regulations
  - To insure proper service life without expensive maintenance and trouble shooting



How Standards Evolved

- The use of standards dates back to ancient Rome and Greece primarily in the use in manufacturing of tools and weapons.
- Early standards in the United States were introduced in the 1700s, and some were adapted from early European standards primarily in Fonts and layout in printing and weapons manufacturing.
- The first manufacturing tolerances system was developed in the 1790s, used by armories in the production of the first interchangeable parts for flintlock muskets. Prior to this, muskets were assembled by hand with custom-fitted parts that generally would only work with that individual weapon

Standards Organizations

- Modern standards agencies and associations were first organized starting in the late 1800's
  - American Society of Mechanical Engineers (**ASME**) in 1880
  - American Water Works Association (**AWWA**) in 1881
  - American Society for Testing and Materials (**ASTM**) in 1898
  - Society of Automotive Engineers (**SAE**) in 1905
  - Deutsches Institut fur Normung (**DIN**) in 1917
  - American National Standards Institute (**ANSI**) in 1919
  - American Petroleum Institute (**API**) in 1919
  - Fluid Controls Institute (**FCI**) in 1921
  - Manufacturers Standardization Society (**MSS**) in 1924
  - Association Française de Normalisation (**AFNOR**) in 1926
  - International Standards Organization (**ISO**) in 1947

Standards Organizations

- Major US Organizations
  - Three standards organizations and societies who publish standards related to the valve industry:
    - ➢ API – American Petroleum Institute
    - ➢ ASME – American Society of Mechanical Engineers
    - ➢ MSS – Manufacturers Standardization Society

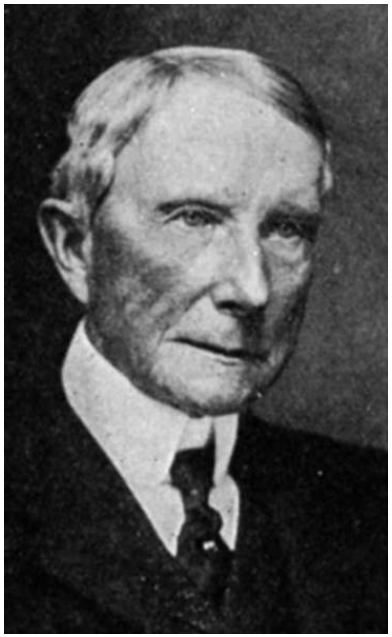
- **Accreditation Organization**
  - ANSI – American National Standards Institute.
    - ➢ Facilitates the development of American National Standards by accrediting the procedures of standards developing organizations.
    - ➢ US voting member in ISO where each member nation gets one vote

Standards Organizations

	Write Standards	Description	Membership	Valve committee
ANSI	No	Facilitates the development of American National Standards (ANS's) by accrediting the procedures of standards developing organizations	Government Agencies, Companies, Academic and International Bodies, and members from each of the organizations listed below	None
API	Yes	Promote safe and proven engineering practices for the design, fabrication, installation, inspection, and use of materials and equipment in refineries and related processing facilities	Oil Companies, Valve Manufacturers, Manufacturers' Representatives, Contractors, and Refineries **(Company Membership)**	Committee on Refinery Equipment / Subcommittee on Piping and Valves
ASME	Yes	To establish … rules relating to pressure integrity governing the construction of pressure vessels, Valves and related equipment	Mechanical and Nuclear Engineers, Engineering &Contractor Companies **(Individual Membership)**	BPVC Committees, B16 Committee, B31 Committee
MSS	Yes	Provide MSS members the means to develop engineering standard practices for the use and benefit of the industry and users of its products	Valve, Flange, Gasket, and Fitting Manufacturers **(Company Membership)**	Valve Technical Committee

API History

- Interesting that the first Industry conglomerate was named “Standard”
- John Davison Rockefeller 1839-1937
  - Started Standard Oil in Cleveland, Ohio in 1870
  - By 1908, controlled 90+% of U.S. Oil production
  - In 1911, the U.S. Government forced the dissolution of Standard Oil into (34) separate companies, including
    - Jersey Standard became Exxon
    - Standard of New York became Mobil
    - Standard of California became Chevron
    - Standard of Indiana became Amoco
    - Standard of Ohio became Sohio



API History (continued)

AMERICAN PETROLEUM INSTITUTE

- By 1914, the U.S.A. was deeply involved in World War I, and increasing petroleum production & reserves became a national priority
- U.S. Congress now had to deal with over (50) petroleum producers in order to increase domestic petroleum production
- Oil companies tried to “pool” drilling resources and jointly develop wells
- No matter what incentives or encouragement were offered by the National Petroleum Service Committee, production increases were very minimal due to:
  - Incompatibility of drilling components. There was no uniformity of pipe sizes, threads and couplings.
  - No standardization of refining components such as valves and flanges.
  - Thus the new association took up the challenge of developing industry-wide standards and the first standards were published in 1924, drilling threads

API History (continued)

- API – American Petroleum Institute was created on March 20,1919 and has expanded globally
  - To work with U.S. Gov't on National Security Issues
  - Focused on the oil and natural gas production and refining industry
  - Create standards for the oil and gas industries
  - Started as an American standards organization
- Charter members were all of the ex-Standard Oil companies
  - ExxonMobil
  - Chevron
  - Sohio
  - Amoco
  - Etc. and Independents, such as Humble Oil

API Standards Process

- American Petroleum Institute (Refining)
  - Main body is the *Committee for Refinery Equipment* (CRE)
  - Under CRE is the Subcommittee and the Manufacturers Subcommittee for Piping and Valves with a balanced membership of end users, manufacturers and contractors.
  - Two subgroups are the *Quarter Turn* and the *Gate, Globe, Check and & Quality*
  - Inquiries are received and processed by CRE. Standards are revised every five years and a Task Group is formed with a Manager/Task Group Chair. Drafts are prepared and balloted to the membership. Negatives and technical comments are resolved and new edition of the standard is published.

API Standards

- API – American Petroleum Institute
  - Some standards and recommended practices dedicated to the design, integrity, inspection, and quality of valves.
    - API RP 591, Process Valve Qualification Procedure.
    - API Std. 594, Check Valves: First published in 1974, currently in 10th edition
    - API Std. 598, Valve Inspection and Testing: Published in 1968, currently 9th edition
    - API Std. 600, Steel Gate Valves: First published in 1949, currently 13th edition
    - API Std. 607, Fire Test for Soft Seated Quarter-Turn Valves: First published in 1977, currently in the 5th edition
    - API Std. 609, Butterfly Valves: Double-Flanged, Lug, and Wafer-Type
    - API Std. 623, Steel Globe Valves: New standard, published in 2012
    - API Std. 624, Type Testing of Rising Stem Valves for Fugitive Emissions: New standard published in 2013
    - API 6D, pipeline Valves: First published in 1947, currently in 24th edition

ASME History

- ASME – American Society of Mechanical Engineers
  - Started as an American standards society of mechanical engineers responding to deadly utility and railroad boiler explosions and has expanded its influence globally
  - In 1880, the year ASME was formed, there were 159 boiler explosions across the United States. As a result it established a boiler testing code in 1884
  - In the first 10 years of ASME's existence, there were more than 2,000 boiler explosions of the estimated 100,000 boilers in the United States
  - The ASME Boiler and Pressure Vessel Code was conceived in 1911 out of a need to protect the safety of the public
  - The first edition of the ASME Boiler and Pressure Vessel Code, titled ***Rules for the Construction of Stationary Boilers and for Allowable Working Pressures***, completed in 1914, was published in 1915 consisting of 114 pages
  - Currently Document containing twelve (12) sections in 28 books dedicated to the design, integrity, inspection, and quality of boilers and pressure vessels (i.e., valves), with two (2) sections of code cases, totaling over 16,000 pages

ASME Standards Process

- ASME B16 Standards Committee
  - Under the “Board for Pressure Technology Codes and Standards”
  - Has 6 subcommittees with a balanced membership and is responsible for approximately 34 Standards
  - Individuals apply for membership and are voted in by the subcommittee and Standards Committee.
  - Inquiries for interpretation are directed to the ASME Secretaries aligned with the subcommittees responsible for the standard.
  - Response is prepared by the appropriate subcommittee and voted through the Standards Committee and the Board before interpretation being issued
  - Standards are updates every 3 to 5 years by the subcommittee.

ASME

- ASME B16 Standards
  - Series of standards dedicated to the design, integrity, inspection, and quality of valves and related piping system equipment include.
    - ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings
    - ASME B16.5, Pipe Flanges and Flanged Fittings NPS ½ -24
    - ASME B16.10, Face-to-Face and End-to-End Dimensions of Valves
    - ASME B16.20, Metallic Gaskets for Pipe Flanges
    - ASME B16.25, Butt-Welding Ends
    - ASME B16.34, Valves
    - ASME B16.47, Large Diameter Steel Flanges, NPS 26 -60

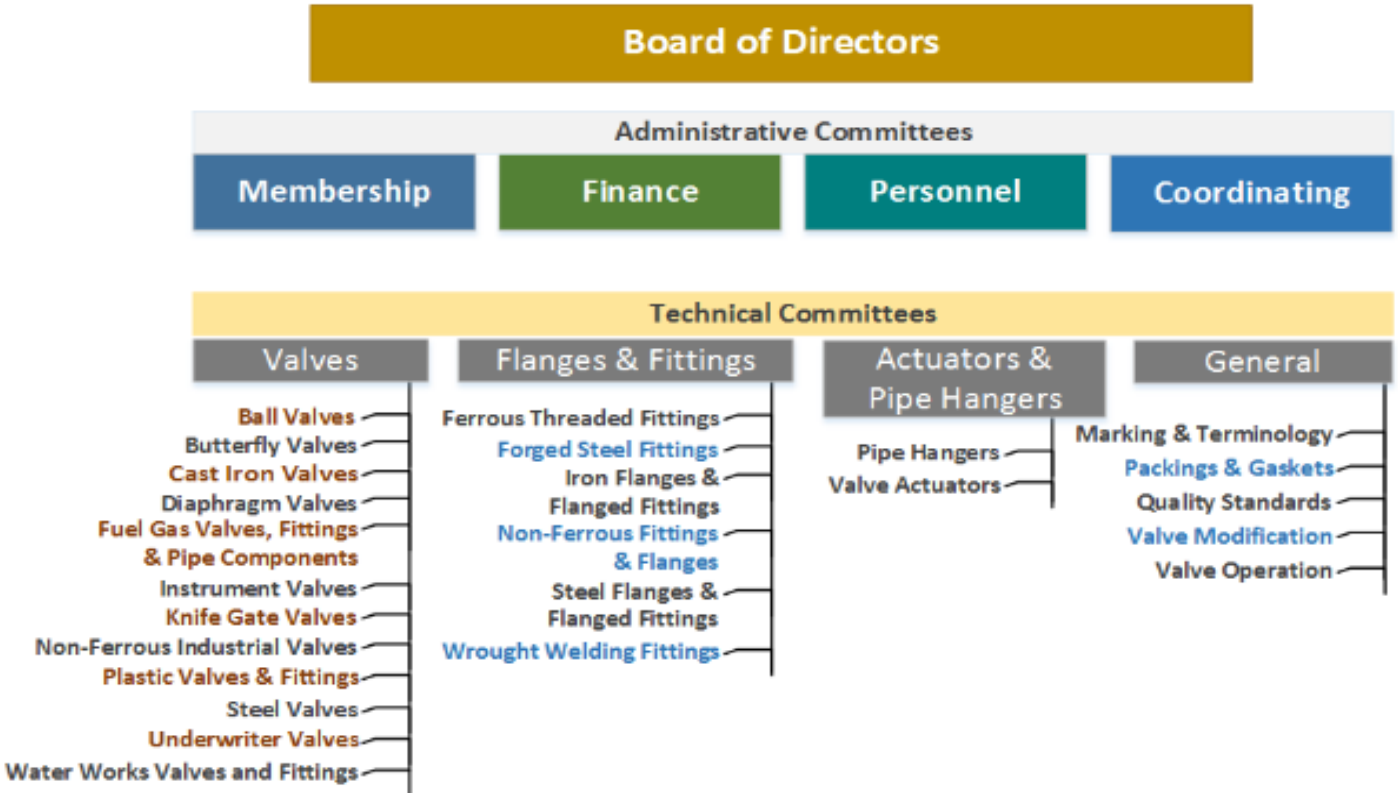
MSS History

- MSS

Manufacturers Standardization Society

Since 1924

The Technical Voice of the Industry



MSS History

- The Manufacturers Standardization Society (MSS) is a non-profit technical association organized for development and improvement of industry, national and international standard practices related to valve actuators, pipe fittings, valve modifications, flanges, pipe hangers, and associated supports.
- Established in 1924 with 18 Charter member companies, including Crane, Powel, Walworth and others.
- Membership is made up of manufacturers
  - Board of directors appoints TC Chair and approves SP's to be created.
  - Technical committees are responsible for the updating of SP's every 5 years.
  - New standards or updates are prepared and approved at the TC level. These are then sent to the Coordinating Committee for final review and approval before being issued.
  - Inquiries come to the Board of Directors. Sent to the responsible TC Chair for resolution. Approved by the Board before response is issued.

MSS Standards

- Some standards dedicated to the design, quality and related piping and support equipment include,
  - MSS SP-6, Standard Finishes for end connections
  - MSS SP-25, Standard Marking System
  - ANSI/MSS SP-44, Steel Pipeline Flanges
  - MSS SP-53, Quality Standard – Magnetic Particle
  - MSS SP-54, Quality Standard – Radiography Examination
  - ANSI/MSS SP-55, Quality Standard – Visual Method for Evaluation of Surface irregularities
  - MSS SP-68, High Pressure Butterfly Valves with Offset Design
  - MSS SP-72, Ball Valves with Flanged or Butt-Welding Ends
  - MSS SP-80, Bronze Gate, Globe, Angle, and Check Valves
  - MSS SP-88, Diaphragm Valves
  - MSS SP-92, MSS Valve User Guide

Standards Development and Cost

- Development of MSS SP-144, Pressure Seals
  - Addendum in API 600, 10th edition
  - Removed as co-branded document API600/ISO10434
  - Brought to ASME for inclusion in B16.34
  - MSS agreed to create document, SP-144, published in 2013
- One reality not mentioned is the cost to produce a valve standard.
  - Individual volunteers translates into lost time from daily office work.
  - One estimate due to attending meetings, working on subgroups and task groups, reviewing the standards and submitting comments and voting is approximately US $50,000.
  - Meetings are attended by 30 or more voting members for three days, add transportation, hotel and meals, and the value of the standard can be up to US$135,000 before a single page is printed.

Similar Product Standards

Valve Type	Standard	Standard	Standard	Standard
Steel Ball	API 608	MSS SP-72		ISO 17292
Steel Gate	API 600			ISO 10434
Steel Check	API 594			
Gray iron check	API 594	MSS SP-71		
Steel butterflies	API 609	MSS SP-68		ISO 10631
Pipeline Ball	API 6D			ISO 14313
Process Piping	ASME B31.3			ISO 15649
Steel Globe	API 623			ISO 12149
Testing	API 598	MSS SP-61		ISO 5208
Fugitive Emissions	API 624			ISO 15848-1
Cryogenic		MSS SP-134	BS 6364	ISO 21011
End to End	ASME B16.10			ISO 5752
Fire testing	API 607			ISO 10497

Thank you

Questions?