

American and IEC Standards

Feldimir D. Siao, MTM, REE, EE

What is a Standard?

Standard is a document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.

NOTE: Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits.

ISO/IEC Guide 2:2004, 3.2

Type of Standards?

Basic Standards

- Terminology
- Symbols
- Units
- Drawing rules

Product Standards

- Dimensions
- Material properties
- Product properties
- Variety reduction

Methods Standards

- Test methods
- Procedure standards

Framework Standards

- Dimension and module
- Coordination

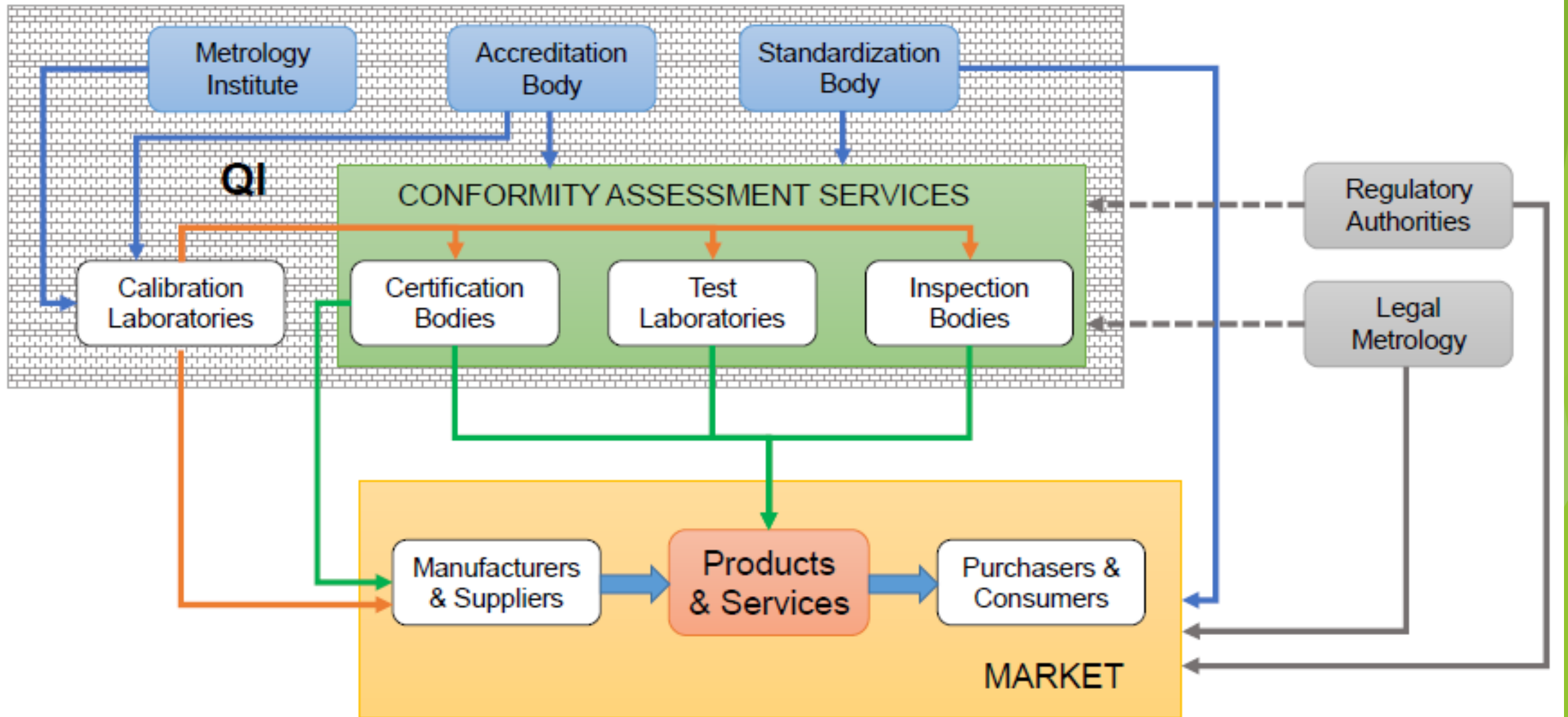
Quality Standards

- Quality standards
- Safety standards
- Environmental standards

Functional Standards

- Function
- Interfaces
- Interchangeability

Quality Infrastructure



Local Standardization

- ▶ **REPUBLIC ACT 4109 : STANDARDIZATION LAW OF THE PHILIPPINES 1964**
 - ❑ Create the Bureau of Product Standards (BPS)
- ▶ **REPUBLIC ACT 7394 : CONSUMER ACT**
 - ❑ Department of Agriculture - standards for agricultural products
 - ❑ Department of Health - standards for food, health products, and health devices
 - ❑ Department of Trade and Industry - standards for products not covered by DA and DOH
 - ❑ Liaison with other Standards Developing Organizations with mandates to develop standards to promulgate the standards they develop as PNS (ex: DOE) given that they conform with BPS Directives
- ▶ **WTO-TECHNICAL BARRIERS TO TRADE AGREEMENT**
 - ❑ Standards developed by BPS, as much as possible, should be aligned with International Standards to reduce barriers to trade

Deviations can be made following legitimate objectives as prescribed under the WTO/TBT agreement as follows:

- ▶ National security requirements
- ▶ Prevention of deceptive practices
- ▶ Protection of human health or safety, animal or plant life or health or the environment
- ▶ Fundamental climatic or other geographical factors

BPS PROGRAMS AND SERVICES

**Standards
Development**

**Standards
Conformity**

**Standards
Mainstreaming**

Product Testing

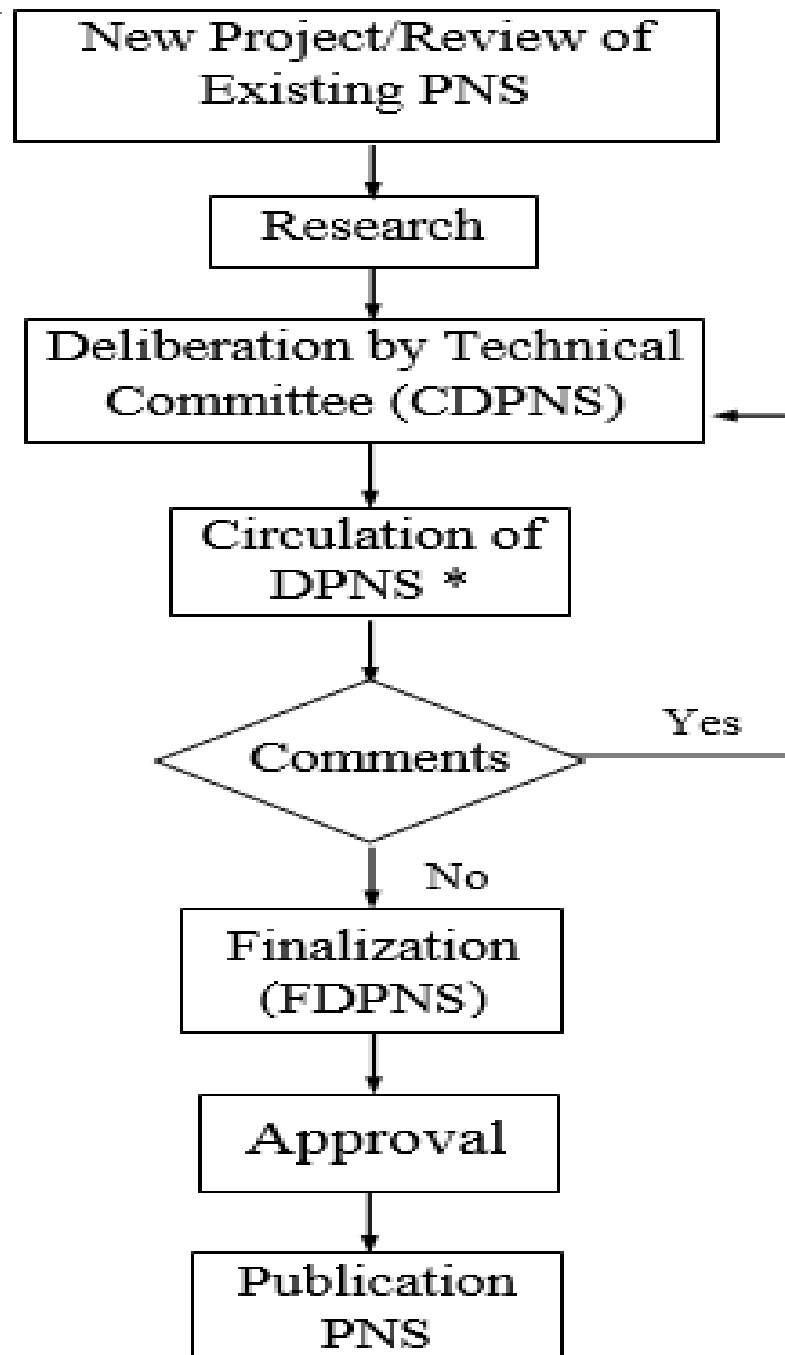
Guidelines for the prioritization of project for development of standards

- ▶ Consistent with roles and functions of BPS as mandated
- ▶ Significance - health, safety, environment and efficient use of local resources
- ▶ Impact on national and international trade
- ▶ Problems experienced on use of the standards by implementing bodies

How are Philippine National Standard Develop?

1. Project approach
2. Fast-track method

Project Approach



Project Stages and Associated Documents

Project stage	Associated Document	Abbreviation
Proposal	New work item proposal	NWIP
Preparatory	Working draft(s)	WD
Committee	Committee draft(s)	CDPNS
Circulation or Enquiry	Enquiry draft	DPNS
Approval	Final draft Philippine National Standard	FDPNS
Publication	Philippine National Standard	PNS
Maintenance	Philippine National Standard	PNS

Fast Track Method

- ▶ Direct entoto adoption of standard
- ▶ Standards such as Guide, Terminology, Vocabulary, Classification, Symbol, etc
- ▶ Standards developed by other Standards Developing Organizations (SDOs) whose procedures follow the BPS Directives

Benefits of referencing Standards

International Standards:

- ▶ Are developed in a multi-stakeholder environment and reflect a double layer of consensus (between the technical experts and also between countries).
- ▶ Allow products to be supplied and used across different markets, reducing market inefficiencies and facilitating regulator compliance.
- ▶ Can be used for conformity assessment to enhance confidence in products, systems, processes, services or personnel.
- ▶ Offer the same level of consumer protection whether applied in a mature or evolving economy
- ▶ Are globally applicable

Benefits of referencing Standards

National Standards:

- ▶ The legislator can rely on recognized solutions and does not need to re-invent the wheel.
- ▶ The methodology of developing standards - consensus, openness and transparency - more readily facilitates the acceptance of the technical regulation
- ▶ Standards can be more readily updated as and when technology circumstances change


Benefits of referencing Standards

National Standards:








- ▶ The overall development process is more efficient
 - ❑ Costly duplication of effort is avoided
 - ❑ Cost of developing the technical requirements are largely shifted from the public to the private sector
- ▶ Standards better reflect technical reality in the market than technical regulations developed in isolation
 - ❑ Many sources of expertise are involved in the standards development
 - ❑ Final outcome are received and supported by the interested parties

Familiar Standards

American

 <p>ANSI American National Standards Institute</p>	ANSI	American National Standards Institute
 <p>ASTM INTERNATIONAL Standards Worldwide</p>	ASTM	American Society for Testing and Materials
 <p>IEEE</p>	IEEE	Institute of Electrical and Electronic Engineers
 <p>ASSOCIATION 18 EDISON 85 ILLUMINATING CO.</p>	AEIC	Association of Edison Illuminating Companies
 <p>NEMA National Electrical Manufacturers Association</p>	NEMA	National Electrical Manufacturers Association
 <p>ICEA</p>	ICEA	Insulated Cable Engineers Association
 <p>UL</p>	UL	Underwriters Laboratories

Familiar Standards

European			Country
	IEC	International Electrotechnical Commission	International
	CENELEC	European Committee for Electrotechnical Standardization	European Union
	AFNOR	Association Française de Normalisation	France
	BS	British Standards Institution	United Kingdom
	DIN	Deutsches Institut für Normung	Germany
	CEBEC	Comité Electrotechnique Belge/Belgisch Elektrotechnisch Comité	Belgium
	AENOR (UNE)	Asociación Española de Normalización y Certificación	Spain

Voltage Level Classification

Voltage Classification	American	IEC
Low voltage	$\leq 600 \text{ V}$	$\leq 1000 \text{ V}$
Medium voltage	$> 600 \text{ V} - \leq 69 \text{ kV}$	$> 1000 \text{ V} - \leq 35 \text{ kV}$
High Voltage	$> 69 \text{ kV} - \leq 230 \text{ kV}$	$> 35 \text{ kV} - \leq 230 \text{ kV}$
Extra High Voltage	$> 230 \text{ kV} - \leq 1,100 \text{ kV}$	$> 230 \text{ kV} - \leq 1200 \text{ kV}$
Ultra High Voltage	$> 1,100 \text{ kV}$	

American and IEC Standards

▶ How standards are developed?

- ▶ IEC Standards are developed by group of experts from various countries representing the manufacturers, industry, academe, professional associations, compliance regulators, testing laboratories, etc.
- ▶ American Standards are developed by group of experts from the same associations:
 - ❑ NEMA - Manufacturers (ICEA is the power cable technical arm of NEMA)
 - ❑ AIEC - Distribution Utilities
 - ❑ UL - Testing Organization in charge with enforcing product safety rules outlined in NEC

IEC Standards

- ▶ IEC Standards cannot reference a standard issued by another organization. Only IEC Standards can be reference.
- ▶ No standard can conflict with another IEC Standards.
- ▶ No amendments are allowed between revision cycles except for safety issues.

Comparison of American and IEC Standards on Medium Voltage Power Cables

- ▶ IEC voltage ratings are given in three terms:
 - ❑ U_0 - rated power frequency voltage between the conductor and earth or metallic screen for the which the cable is designed. (phase to ground)
 - ❑ U - rated power frequency voltage between the conductors for which the cable is designed (phase to phase)
 - ❑ U_m - maximum value of the highest system voltage for which the equipment can be used.

Comparison of American and IEC Standards on Medium Voltage Power Cables

► Cable Systems:

ANSI/ICEA S-97-682-2007	IEC 60502-2
<p>100% Insulation Level: this category may be applied where the system is provided with a relay protection such that ground faults will be cleared as rapidly as possible, but in any case within 1 minute.</p>	<p>Category A: this category comprises those systems in which any phase conductor that comes in contact with earth or an earth conductor is disconnected from the system within 1 min;</p>
<p>133% Insulation Level: this category may be applied in situation where the clearing time requirements of the 100% level category cannot be met, and yet there is adequate assurance that the faulted section will be de-energized in a time not exceeding 1 hour</p>	<p>Category B: this category comprises those systems which, under fault conditions, are operated for a short time with one phase earthed. This period, according to IEC 60183, should not exceed 1 h. For cables covered by this standard, a longer period, not exceeding 8 h on any occasion, can be tolerated. The total duration of earth faults in any year should not exceed 125 h;</p>
<p>173% Insulation Level: this category should be applied on systems where the time required to de-energize de energized a grounded section is indefinite.</p>	<p>Category C: this category comprises all systems which do not fall into category A or B.</p>

Comparison of American and IEC Standards on Medium Voltage Power Cables

ANSI/ICEA S-97-682-2007	IEC 60502-2
2001 - 5000 V	
5001 - 8000 V	3.6/6 (7.2) kV
	6/10 (12) kV
8001 - 15000 V	8.7/15 (17.5) kV
15001 - 25000 V	12/20 (24) kV
25001 - 28000 V	18/30 (36) kV
28001 - 35000 V	
35001 - 46000 V	

Comparison of American and IEC Standards on Medium Voltage Power Cables

Specifications	ANSI/ICEA S-97-682-2007	IEC 60502-2
Conductor Sizes	AWG	Metric
Lay Length	8 to 16 times of the outer layer	Not required to be twisted
Insulation		PVC/B
	XLPE/TRXLPE	XLPE
	XLPE/TRXLPE (Class III)	
	EPR	EPR
		HEPR
BIL @ 35kV	200 kV	170 kV
Test classification	Qualification Test	Type Test
	Production Test	Routine Test
Hot Set Test Temperature @ 15 minutes	150 °C	200 °C

Comparison of American and IEC Standards on Medium Voltage Power Cables

Specifications	ANSI/ICEA S-97-682-2007	IEC 60502-2
Water Absorption Test	7 days at 70 °C	14 days at 85 °C
Shrinkage	Not required	4% Max after 1 hr @ 130 °C
Elongation after	200% 7 days @ 121 °C	150% 7 days @ 100 °C
Cold Bending	-55 °C	-15 °C
Heat Shock @ 1 hr	121 °C	150 °C
Partial Discharge	5 pC	5 pC
Impulse Test	None	10 positive and 10 negative voltage impulses
Accelerated Water Treeing Test (AWTT)	120 days 180 days 360 days	none

Harmonization of Standards

- ▶ New standards being develop by Technical Committee are based on IEC Standards. (Adoption of IEC Standards).
- ▶ Revision of existing standards are being aligned to IEC Standards with National Differences as noted in the Standard. Technical Committees can add, modify or delete requirements based on:
 - ❑ National regulatory requirements
 - ❑ Basic safety principals and requirements
 - ❑ Safety practices
 - ❑ Component standard
 - ❑ Editorial comments/corrections
- ▶ Existing local standards are being withdrawn and IEC Standards are being adopted).

Thank You!!!