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STANDARDIZATION, SIMPLIFICATION AND SPECIFICATIONS

Lecture by Maj. Wm. B. Hardigg, O.D.
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These three terms are closely related. All are involved in procurement planning. I hope to bring out during this discussion how deeply Industrial Standardization and the preparation of procurement specifications are involved in the preparation of our "Military Shopping List" and in the launching of an emergency procurement program.

Reference - The subject of standards and standardization is very well covered in the first six chapters of the book written and compiled by Mr. E. N. Harriman, the present vice-chairman and secretary of the Federal Specifications Board who was formerly an engineer of tests of a railroad and a technical employee of the Bureau of Standards. This book prepared by an employee of the Federal Government properly gives credit to the War and Navy Departments for a considerable share in the development of standardization. The National Bureau of Standards has naturally been largely and directly interested in this work as has been some branches of the Department of Agriculture.

There are several copies of Harriman's book in the library. I recommend it to students in the school though it is more than five years old and will soon need revision. I am borrowing heavily from it.

Standardization has been called the foundation of civilization.

Some standards of behavior are essential if beings are to assemble and live in a group.

Whenever peoples have grouped themselves and have produced articles of common use barter and exchange and self protection have made necessary prescribed rules of action, definite forms and sizes of articles, weights, measures and some form of money. Such standards may be found in all times and among all peoples. With advancing culture and growing commerce their number multiplies.

Evolution - The evolution of industrial standards parallels the evolution of industry through the household, handicraft, guild and cottage periods into the factory period and so down to the present day.

The great inventions of the Renaissance period of European history.- Explosives, the printing press, the compass, lead to the development, revision and extension of standards of every description.

The invention of the steam engine, the application of machines in the textile industry, the development of electrical machinery and the internal combustion engine are all prominent landmarks in the evolution of Industrial Standards.

It has been because of standardization in industry that Western civilization has been able to forge ahead while Oriental civilization has lagged. The Oriental has in the past been slow to adopt labor saving devices but has standardized his daily life. A Chinaman's

clothes, his hut, plow and rice paddy are pretty thoroughly standardized yet he has shown little desire for modern machinery and methods.

There is no doubt that standardization of materials, machines, processes, and products has been of prime importance in the development of the industrial arts. Imagine the chaos if each railway had its own gauge of track, each automobile its own peculiar tire, each electric light system its own particular light bulbs.

The scientist as well as the engineer has played an important part in the development of standards for materials and process. Particularly is this true of the chemist and physicist. The development of alloys in metallurgy and lubricants and fuels for motors for examples.

Define - Standards -

A standard may be defined as a criterion measure or example of procedure, process, dimension, extent, quantity, quality or time which is established by authority, custom or general consent as a definite basis of reference or comparison.

The National Bureau of Standards classifies and defines standards under five headings:

1. Standards of measures
2. Standards of Constants
3. Standards of Quality
4. Standards of Performance
5. Standard of Practice

1. Standards of measurements include reference and working standards for measurements of all kinds both fundamental and derived for expressing quantitative aspects of space, time, matter, energy, motion and their inter-relations.

Measurable physical quantities can be expressed in terms of five units - length, mass, time, thermal and electrical.

2. Standard Constants - These are natural standards, or the measured numerical data as to materials and energy known as physical or standard constants. They are fixed points or qualities which underlie scientific research and industrial processes when scientifically organized.

These standards include the mechanical equivalent of heat, light, electricity, gravitation, melting and boiling points, heat capacities, heats of combustion, atomic weights, etc., determined experimentally and expressed in fundamental standards of measure.

3. Standards of Quality, or purchase standards for materials take the form of specifications or definitions of their characteristics including the measurement of the specified properties by means of the usual standards of measurement. A certain kind of steel, a point or a piece of cloth is found by use to be good or poor. Why is it good or poor? What are the physical or chemical properties that make it of good or poor quality for a particular use? How are its properties to be measured? These are questions for the laboratory to answer and involve investigation and research.

It is impossible to check quality except for those articles for which standards of quality and methods of test have been developed.

4. Standards of Performance are specifications of operative efficiency of machines and devices specifying the factors involved in terms susceptible of measurement. Some examples of devices which may be covered are chronometers, sextants, dry cells, scales, rubber tires, automobile brakes, radio tubes, electric transformers, etc.

There are two distinct types of performance standards -

- 1 - A scientifically determined theoretical maximum
- 2 - A commercial standard of acceptable performance based on the present state of the art.

5. Standards of Practice include codes and regulations formulated after study and experiment for the technical regulation of construction, installation and operation and are based upon standards of measurement, quality and performance.

Examples are safety codes for hazardous occupations, such as the national codes for electricity, gas and aeronautics. Army regulations, Drill regulations, Technical regulations come under this class as do football and base ball rules and rules for the olympic games.

Importance of Standards

Weights and measures are matters of national control. All nations so consider them. The writers of the Constitution who gave the Congress power to "Fix the standard weights and measures" could not see the necessity for measures for heat, electricity, radium and light - yet today

the calorie, the watt, the curie and the candle are as much needed as the yard, the gallon and the pound.

Commerce and trade are five dimensional arts and involve, quantity, quality, value, place and time. All these factors are measurable. Buyer and vendor agree on these measurements in the market. Everything made, bought, sold or used is measured at some stage of its existence. Quantity, Quality and Price enter into every commercial transaction and no transaction can be on a satisfactory basis until they are expressed in measurable terms.

So much for standards - let us turn to standardization.

STANDARDIZATION - DEFINED

Standardization primarily means the setting up of standards by which quantity, quality, value or performance may be judged. It is the crystallization of the best thought and practice of industry, business or art into definite forms for general usage.

A standard then is a carefully drawn description of the necessary characteristics of a material, a machine, an article or a method of performing a function. Such a standard is simply the best that can be decided upon at the time the standard is set up. Improvements are desired and can be adopted when found. Standardization does not preclude innovation. A proposed change in a standard should be as carefully considered as was the established standard and by as competent people. The idea of perfection is not involved in standardization.

Industrial standardization is dynamic not static. It is arrived at by continuous research and the evaluation of the several factors which will give the maximum feasible utility to materials, processes or products.

Standardization may be applied in individual plants or in entire industries. Best results require that all interests cooperate in setting up standards: Manufacturer, distributor and consumer are each entitled to a voice in the proceedings.

Standardization is used in two wholly different senses:

(1) The prescription by law and the supervision and enforcement by legally constituted authorities of standards of length, capacity, weight and money together with other standards of purity, strength or quality which may be considered necessary to protect health, safety or well being of the public.

(2) Voluntary standards fixed by the interests concerned with the object of having definite standards and a limited variety of products in use in order to eliminate waste of labor, material and capital and thereby reducing the costs of production, distribution, purchase and use.

The growth of the system of production by elaborate machinery on a large scale tends powerfully to encourage standardization. While standardization is commonly associated with mass production the economies resulting from standardization are distinct from those of large scale production.

Voluntary standardization is applicable to not only commerce and industry but to art and sports. A definite concert pitch is used for tuning musical instruments and there is a standard size golf ball.

In the marketing of many natural products such as grains and fibers recognized grades have been established for the convenience of vendors and buyers.

A high degree of standardization is not necessarily practicable or desirable in all branches of manufacture. When goods are made for export the market may have to be considered. In such goods as textiles, styles and artistic qualities may be controlling features.

The ultimate object of Industrial Standardization is the elimination of waste in time, materials and labor - all very important factors in war. Consequently, those interested in planning for war procurement should study and foster Industrial Standardization.

Standardization may be considered under several aspects as follows:

- 1. Relations between men, methods and products
- 2. Standardization of Nomenclature
- 3. Standardization of Variety - Simplification
- 4. Standardization of Dimension
- 5. Standardization of Quality or Specification

Standardization of variety or simplification was first made use of by the United States Government during the World War. This

activity was known as the Conservation Division of the War Industries Board and was charged with releasing the largest possible amounts of labor, capital, materials and equipment for war purposes.

It had two courses open to it -

- (1) To curtail production in so-called non-essential industries
- (2) To stop non-essential uses of labor, capital, materials and equipment in all industries.

The latter course was followed.

The Division of Simplified Practice in the National Bureau of Standards was organized in 1921 and amplified in 1927 to continue and extend the principles developed by the War Industries Board.

This Division is one of five now in process of transfer from the Bureau of Standards to the American Standards Association. I can best explain the status by reading from the recent address of the President of the American Standards Association reported in the monthly bulletin of that Association for November -

See Bulletin

The application of standardization to items of equipment and supply required by the War Department and the preparation of procurement specifications is covered by A.R. 850-25. The procedure set up in this Army Regulation has been followed in the recent preparations for the purchase of motor equipment under Public Works funds.

General Order 3 of 33 announces who will buy motor equipment. General Order 9 of 33 announces War Department Policies in regard to Motor Equipment. These announced policies have been of great assistance in the simplification of required types and in coordinating the requirements of the various using arms and services. The policies announced relate primarily to required speeds and weights.

A statement of military characteristics has been drawn up for each required type as prescribed in A.R. 850-25.

The availability of types in industry has been carefully considered in approving specifications for procurement by the Assistant Secretary of War.

The evolution of types of material for the mechanization of our Army is wonderfully well set forth by General MacArthur in his testimony before the House Committee on Military Affairs. Under date of April 26, 1933 (Recorded on pages 26 to 32 of this Government Printing Office Pamphlet).

To those of you interested in the subject of standardization I suggest that you compare General MacArthur's statement with Chapter II of the Thesis of the Mechanical Engineer of the American Standards Association, Mr. John Gaillard, in which he describes the essential functions of Industrial Standardization as applied to the Automotive Industry.

I believe that you will find the "Essential functions" described by Dr. Gaillard considered in General MacArthur's statement of tactical doctrines and discussion of mechanical equipment applied to battle uses.

What industry goes through in the development of devices we in the Army must go through. In the Army the supply arms and services stand in the place of the producers. The using arms and services stand in the place of the consuming public.

The procedure set up in 850-25 is very similar to standardization procedure in industry and commerce. I believe it to be sound.

IF TIME PERMITS DISCUSS

Procedure found workable. No changes in procedure to be suggested.

Complicated situation has been resolved

Army Specifications -

War Experience - Jaffre Mission

Difficulties

Terms -

Lack of terms in Industry - qualities of surfaces.

Methods of test

Personnel

Not given sufficient importance.

Lecture -

Army Industrial College

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