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U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards

Report of the 59th National Conference on Weights and Measures 1974

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[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.
[2] Part of the Center for Radiation Research.
[3] Located at Boulder, Colorado 80302.
[4] Part of the Center for Building Technology.

Report of the

59th National Conference on Weights and Measures 1974

Sponsored by the National Bureau of Standards
Attended by Officials from the Various States, Counties, and Cities, and Representatives from U.S. Government, Industry, and Consumer Organizations
Washington, D.C., July 7-12, 1974

Report Editor: Sandra J. Edgerly

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Rogers C. B. Morton, *Secretary*

National Bureau of Standards
Richard W. Roberts, *Director*

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Abstract

This is a report of the proceedings (edited) of the Fifty-Ninth National Conference on Weights and Measures, sponsored by the National Bureau of Standards, held in Washington, D.C., July 7–12, 1974, and attended by state, county, and city weights and measures officials, the Federal Government, business, industry, and consumer organizations.

Key words: Digital indicators; drained weight; laws and regulations; metric conversion; metrication; net weight; package control; petroleum products; scales; survey; temperature compensation; uniformity; weights and measures.

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OFFICERS OF THE CONFERENCE

President: RICHARD W. ROBERTS, Director, National Bureau of Standards.
Executive Secretary: H. F. WOLLIN, Chief, Office of Weights and Measures, National Bureau of Standards.
Chairman: J. H. LEWIS, Chief, Weights and Measures Section, Dairy and Food Division, Washington Department of Agriculture.
Vice Chairmen:
L. H. DE GRANGE, Field Supervisor, Weights and Measures Section, Division of Inspection and Regulation, Maryland Department of Agriculture.
L. D. DRAGHETTI, Sealer of Weights and Measures, Agawam, Massachusetts.
G. E. MATTIMOE, Deputy Director, Division of Weights and Measures, Hawaii Department of Agriculture.
W. R. SEVIER, Inspector of Weights and Measures, Gibson County, Indiana.
Treasurer: C. C. MORGAN, Sealer of Weights and Measures, Gary, Indiana.
Chaplain: J. I. MOORE, Superintendent, Weights and Measures Division, North Carolina Department of Agriculture.

APPOINTED OFFICIALS

Sergeants at Arms:
R. R. ROOF, Laboratory Metrologist, Bureau of Standard Weights and Measures, Pennsylvania Department of Agriculture.
W. C. SULLIVAN, Supervisor, Weights and Measures, Seattle, Washington.
Parliamentarian: D. L. GRIFFITH, Director, Division of Consumer Protection, West Virginia Department of Labor.

EXECUTIVE COMMITTEE

R. E. BOWERS
A. W. FENGER
G. S. FRANKS
E. KEELEY
R. K. LORENZ
L. A. RICK
N. M. ROSS
H. E. SANDEL
J. C. STEWART
C. WOOTEN

(All officers of the Conference are, ex officio, members of the Executive Committee.)

(Officers and Executive Committee members elected by the 59th National Conference to serve the 60th National Conference on Weights and Measures will be found in the report of the Nominating Committee, page 246.)

STANDING COMMITTEES

(The remaining term of office for each committee member, in years, is shown in parentheses.)

EDUCATION, ADMINISTRATION, AND CONSUMER AFFAIRS

D. I. OFFNER, St. Louis, Missouri, Chairman (1)
W. B. HARPER, Birmingham, Alabama (4)
E. PRIDEAUX, Colorado
S. VALTRI, Philadelphia, Pennsylvania (3)
R. T. WILLIAMS, Texas (2)

(W. H. KORTH, Ventura County, California, was appointed for a five-year term to replace E. Prideaux, whose term expired. Mr. Offner was reelected as chairman.)

LAWS AND REGULATIONS

R. M. LEACH, Michigan, Chairman (1)
S. D. ANDREWS, Florida
J. L. O'NEILL, Kansas (3)
R. L. THOMPSON, Maryland (2)
C. H. VINCENT, Dallas, Texas (4)

(J. T. BENNETT, Connecticut, was appointed for a five-year term to replace S. D. Andrews, whose term expired. Mr. Thompson replaced Mr. Leach as chairman.)

LIAISON WITH THE FEDERAL GOVERNMENT

L. D. HOLLOWAY, Idaho, Chairman (1)
A. SANDERS, Scale Manufacturers Association
W. N. SEWARD, American Petroleum Institute (2)
J. F. SPEER, Milk Industry Foundation (3)
E. H. STADOLNIK, Massachusetts (4)

(C. G. GEHRINGER, Pennsylvania Scale Company, was appointed for a five-year term to replace A. Sanders, whose term expired. Mr. Seward replaced Mr. Holloway as chairman.)

SPECIFICATIONS AND TOLERANCES

T. F. BRINK, Vermont, Chairman
W. E. CZAIA, Minnesota (3)
M. L. KINLAW, North Carolina (4)
K. J. SIMILA, Oregon (2)
W. S. WATSON, California (1)

(J. R. BIRD, New Jersey, was appointed for a five-year term to replace T. F. Brink, whose term expired. Mr. Watson replaced Mr. Brink as chairman.)

ANNUAL COMMITTEES

Nominations: G. L. JOHNSON, Kentucky, Chairman; E. H. BLACK, Ventura County, California; J. C. BOYD, Iowa; S. H. CHRISTIE, New Jersey; G. L. DELANO, Montana; J. F. LYLES, Virginia; C. C. MORGAN, Gary, Indiana.

Resolutions W. H. KORTH, Ventura County, California, Chairman; N. BUCUR, Lake County, Indiana; R. H. HELMICK, Arizona; W. F. JUNKINS, Pennsylvania; T. E. KIRBY, Georgia; D. L. LYNCH, Kansas City, Kansas; W. J. TUSEN, New Hampshire.

Auditing: W. B. HARPER, Birmingham, Alabama, Chairman; W. M. BAKER, Missouri; R. W. PROBST, Wisconsin.

Associate Membership: J. F. SPEER, Milk Industry Foundation, Chairman; M. S. GODSMAN, Bennett Pump Company; C. E. JOYCE, The Pillsbury Company; L. J. MOREMEN, International Nonwovens & Disposables Association;

A. SANDERS, Scale Manufacturers Association; R. SOUTHERS, American Petroleum Institute; R. TOLLEY, National Canners Association; E. F. WEHMANN, Neptune Meter Company; E. E. WOLSKI, Colgate-Palmolive Company.

REGISTRATIONS

EVA BEARD, KAY CHURCHEY, DAPHNE GRAY
PATRICIA RASCHELLA, SANDRA J. EDGERLY

LADIES' ARRANGEMENTS

MRS. H. F. WOLLIN

MONDAY, JULY 8, 1974

OPEN COMMITTEE MEETINGS

Monday was set aside for meetings of the four Conference standing committees. Notices of these meetings were carried in the Conference Announcement booklet, in all pre-Conference publicity, and in the printed Conference program. Many delegates participated in the committee meetings. The discussions which took place were particularly helpful to the members of each committee and played an important role in guiding the committees in their deliberation and preparation of their final reports. The final reports of the committees will be found beginning on page 199 and will reflect the discussion that took place and the actions taken by the Conference at the time the final reports were presented to the delegates.

MANUFACTURERS' EQUIPMENT DISPLAY

An informal display of new equipment by manufacturers was held on Wednesday afternoon from 1:00 to 4:00 p.m. for the education of the Conference delegates.

REPORT OF THE FIFTY-NINTH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

MORNING SESSION—TUESDAY, JULY 9, 1974

(JOHN H. LEWIS, *Chairman,* Presiding)

Mr. J. I. Moore, North Carolina, the Conference Chaplain, delivered the invocation and led the delegates in the Pledge of Allegiance.

ADVANCING MEASUREMENT ASSURANCE IN THE MARKETPLACE

by JOHN H. LEWIS, *Conference Chairman,* Chief, Weights and Measures Section, Dairy and Food Division, Washington Department of Agriculture

Ladies and gentlemen and special guests, it gives me a great deal of pleasure to extend a warm welcome to the 59th Annual Conference on Weights and Measures.

I feel very honored to be serving as your chairman. I appreciate the confidence you have placed in me by the election to this position. At the time of my election in Minneapolis, I had no idea I would also be chairing the meeting of the joint meetings of the standing committees as we met for the first time in a combined interim venture last January. The many favorable comments and recommendations attest to the success of this venture. The benefits derived from such a joint meeting were recognized by the Executive Committee as it put its stamp of approval on the slight increase in our registration fee to cover the added cost.

This added responsibility of chairing the joint meeting provides another challenge to the newly elected chairman; but I am sure he will find, as I did, the results will be just compensation for the effort expended. I trust this opportunity to expose items under consideration by the committees to a larger group for counsel and deliberation will make a smoother running annual Conference. It is my recommendation to the Conference that the joint interim meetings be approved as a standard procedure.

Advancing measurement assurance in the marketplace has been the goal of this Conference since its inception in 1905. There have been many different titles, themes, and subjects considered through the years, but the goal remains the same. The subjects covered have run the gamut.

The concern over the accuracy and correctness of mechanical devices resulted in the development of specifications and tolerances which were set forth in various handbooks over the years. Various devices have received their due consideration. These have ranged from the simple steelyard scale used in weighing bales of cotton to the new concept of computerized checkstand weighing systems. Volumetric devices from the standardized dry pint and dry quart containers range through the sophisticated liquid measure dispensers; the more recent design being the remote electronic digital readout units. Meters ranging from the lowly length meter used to measure wire and rope to the sophisticated liquid petroleum and vapor meters have had their day under consideration by the Conference.

Methods of sale, as developed by the Conference, have contributed to measurement assurance. One of the earliest items to receive consideration was the method of sale of ice cream on the agenda of the 18th National Conference in 1925. A standing committee on methods of sale functioned from the thirty-first through the fortieth Conference. This committee had a real impact upon uniform methods of sale as well as standardized units in such areas as dairy products, flour, small fruit and berry containers, and, to some degree, uniform labeling. It seems some products continue to bug us—peat moss is a prime example, having appeared on the agenda of at least six different Conferences. Sale and labeling of garden seeds was considered at the 38th Conference; and this item again appears on the agenda at this, the 59th.

Model laws and regulations as developed by the Conference have been a part of the procession of advancing measurement assurance in the marketplace. The justifiable trend to provide the consumer with means to make comparative price evaluations through more adequate informative labeling has also had an effect upon accuracy in the marketplace. The new labeling requirements not only provided a clear, conspicuous quantity statement but basically eliminated the philosophy of the approximate, minimum, or when packed weight concept.

The attainment of compliance and accuracy has been the result of a cooperative effort on the part of many.

Many men of history in the weights and measures fraternity have made their contribution to the establishment of the founda-

tion upon which we work today. One is always reluctant to mention names in the fear of slighting the memory of those who have each had a share in history making. While my tenure with the Conference is limited compared to many of you here today, I must say there are those in my memory who have made a lasting impression on me and on the weights and measures community. These have been men from both the regulatory side of the coin as well as many from industry—men who took the trouble to concern themselves with the issues and participated in the discussions and open forum opportunities to enlighten some of us who were not so well informed. I must say there were occasions when those who spoke most often soon convinced us they were the least informed. But the opportunity to be heard has been limited only by the clock itself. For as time permitted this Conference has enjoyed a very democratic atmosphere.

Many men from industry have given us the benefit of their knowledge and expertise. The relationships and understanding of mutual problems that have arisen between the regulator and the regulated has produced one of the finest of working atmospheres. Common respect for one another, willingness to listen, and each opponent giving a little has resulted in reasonable solutions to many sticky problems. These men who have made their contribution, whether still active or having passed into the background, are, nevertheless, men of history.

Those of us who the Good Lord permits to meet the challenges of tomorrow are men of destiny. We will each make our contribution, in our own way, in our own time, in our own circle of influence. The decisions made during this Conference and those Conferences to follow will have their effect on the future. I am convinced that frequently the unheralded make a greater contribution than we realize. The men in the field, the secretaries and the clerks are those who get the job done. They are truly the individuals who advance measurement assurance in the marketplace. Those of us who sit in policy or rule-making roles merely furnish the tools with which to work.

In my own jurisdiction with our relatively small staff, it is evident that consistent enforcement has been effective. When I speak of my jurisdiction I take pride in including the four cities of Seattle, Tacoma, Spokane (incidentally the site of Expo 74), and Everett. Our combined effort and cooperation has had a definite effect on advancing measurement assurance. Specifically, I would refer to the improvement we have observed in the prepackaging industry.

I recall that initially some fifteen years ago our checkweighing resulted in some 42 percent of all packages checkweighed being

ordered off sale. Through consistent checkweighing programs carried on by our field personnel, follow-up letters by our office staff, and certainly the cooperation of industry and assistance of enforcement people in other jurisdictions, the percentage of off sale has declined to approximately 5 percent. I should add that this percentage figure also includes off-sale action taken for mislabeling as well as short weight.

The same dedicated effort that brought about the results in prepackaging has also been reflected in the field of mechanical devices. Those of us who meet to make decisions, draft laws and regulations, and establish policy would be of no avail if the many workers on our staffs failed to function with the zeal and dedication that produce results.

We are now participating in a very real advancement of accuracy in the marketplace. The computerized checkstand systems, while in their infancy, have the potential to eliminate many human errors. Errors are always costly to someone—either the producer/merchandiser or the ultimate consumer. While many of us in the enforcement field must, of necessity, take a wait and see attitude toward these new electronic systems, we must also concede that upon perfection they will help us to achieve the goal of measurement accuracy which we all desire.

We are now in the planning stage for metrication. While many hours have been expended in planning for a changeover, we have only just begun. The need to avoid duplication of effort and/or authority, assumed or otherwise, is very real. Jealousies, allegations, innuendos, and bickering must be avoided if a smooth and reasonable transition is to be accomplished.

An unknown author has left us with some rather sage advice:

> As you travel down life's pathway,
> Whatever be your goal,
> Keep your eye upon the doughnut
> And not upon the hole.

It is so easy for us, and I include myself, to lose sight of our goal and objective when we become distracted by trivia. As we work with individuals or even groups we frequently allow ourselves to become annoyed with their insignificant peculiarities and idiosyncrasies to the point that we are prone to overlook the virtues, abilities, and traits we should recognize and reward with commendation and praise.

I am sure we all recognize the rather disorganized total metric picture. I feel that until Congress assumes the leadership responsibility that is rightfully theirs and takes the steps to establish a

national metric board, we can only assume our present position and move forward as best we can.

We must recognize and applaud those who are making an effort to bring order out of chaos. Groups have been formed by industry, by individual firms, and by organizations such as ours to make contributions to orderly organization. As we hear from those on the program of our Conference we will learn of efforts, plans, accomplishments, and hopes from various segments that are deeply involved with the challenge that lies before us.

The metric system is advancing upon us faster than we care to admit. At one point metrication was given consideration as being the theme of the 59th Conference. The advent of certain setbacks and delays caused us to reconsider and reach a decision that possibly we were moving too fast. However, you will note from your program that much time has been devoted to this subject. The metric system with the interrelated units, decimalized, and in conjunction with our decimalized monetary system will definitely advance measurement accuracy and price comparison in the marketplace.

I am sure we as men and women of destiny will accept the challenge to do our part in advancing measurement assurance in the marketplace. This involves participation in the national picture or fulfilling our responsibility at home; we each have our part to play. But let us each keep our eye upon the doughnut. May we make every effort to evaluate our priorities and not get too concerned about those things which are inconsequential.

Some of you have been prevailed upon to speak to groups on the metric system. As we move closer to metrication, more, if not all, of us will face the need to calm the fears of the common man or woman as they anticipate what they consider a horrible confusion caused by the changeover. While not an expert, I have had a few occasions to speak to groups on the metric system. I have had the opportunity to attend a metric seminar conducted by experts. I was pleased to note the general tenor of the seminar was one of assurance that a calm approach to metrication was not only desirable but possible if we keep the technicalities to a minimum. The relief you see in the faces of people when they realize it will be a progression rather than a thunderbolt approach emphasizes our need to reassure those to whom we speak rather than confuse them with terms they may never use.

A case in point is the rather big to-do about the proper spelling of the word "metre" or whether someone refers to a gram or litre as a base unit when talking about the metre, gram, and litre. We sometimes get so involved with technicalities that we forget our prime purpose is to help people understand the units they will be

using. May we leave the technicalities to the technicians. Time will iron out such changes as are needed for uniformity.

I wish to take this opportunity to express my appreciation to those with whom I have been working closely this past year: to Dr. Richard Roberts, as president of our Conference, for his hospitality, confidence and understanding; to Dr. Ernest Ambler for his interest in our interim meetings, his hospitality and contribution to the success of our Conference; to Harold Wollin and his staff, without whom we would have no Conference (their attention to detail, putting the Conference together, and keeping me informed of program and committee matters has made this year as chairman a highlight in my career) ; to each officer, committee chairman, and committee member, my appreciation for the effort you have expended to make this a successful year; to each speaker and each panel member for your effort and expertise that adds to our knowledge that we may zero in on that doughnut rather than the hole; to each member of the Conference as your attendance and participation will make a real contribution to the continuing achievement of our perennial goal of advancing measurement assurance in the marketplace.

ADDRESS

by the Honorable BETSY ANCKER-JOHNSON, Assistant Secretary for Science and Technology, U.S. Department of Commerce

At a time of sharpened focus on the differing but complementary functions of the various levels of government, it is particularly appropriate that I address, today, one of the models of cooperative efforts among Federal, state and local governments. I am talking about you!

A success model like this Conference is one of the examples to which the Department of Commerce points with pride when the philosophy of the "New Federalism" is discussed.

Just what is the "New Federalism"? It is the realization that it is not always necessary or efficient to use direct national action to achieve national goals. It is the recognition of the differing roles appropriate to each level of government. It is the implementation of partnership rather than domination among the levels of government.

Our national highway system and the Agricultural Extension Program have established records of achievement with each focusing upon a national goal, implemented, however, at the state and local levels.

All fifty states have been partners with the Federal Highway Administration and the USDA Extension Service in the communication of national needs and in their satisfaction.

In both cases sophisticated technical know-how was required, but implemented through officials familiar with the local population and responsible to it.

Let me add some perspective to this concept of "New Federalism." Despite our tendency to accept such terms as the pollution problem or the transportation problem, we know that the character of these and other public needs is not the same across the nation. The states and the localities within each state differ greatly in size, population, physical environment, and economic development.

Each state has its own administrative framework, the result of its constitution and legislative process, giving differing types of authority to county and municipal or other local governments.

But it is at these levels—state and local—that the responsibility primarily exists for direct services to the people. Thus, it is not surprising that the characteristics of many domestic problems and their detailed solutions vary from locality to locality. Moreover, our nation and its various governmental systems have grown incredibly complex—requiring some rather sophisticated responses to public needs.

Fully one-half of the states have populations greater than three million (as large or larger than Ireland, Israel, or Norway). Sixty percent of the states spent as much as $2 billion in 1969 (or as much as Israel, Turkey, and Venezuela). Approximately one-half billion dollars in general revenue sharing funds went to New York and California last year, but each of these states spent $30 billion of their own money that year. Only eleven out of the fifty states are less than fifty percent urban in character; and none of these eleven has less than forty percent urban population. My contention that our governmental systems have grown complex is self-evident; indeed, there is no alternative.

The depth and enormity of the public service requirements generated by a nation of our size and composition are such that a partnership, drawing upon the resources of government at all levels, is the only sensible approach to meeting these requirements and, I think, will continue to prove the strength of the American political system.

At the Federal level, government is building the nation's capacity to act rather than react—to move away progressively from crisis management towards a planned, deliberate choice of options for the future—meeting problems before they become crises.

For example, there is an enormous effort at the Federal level to make the United States less dependent on imported oil. Our goal is the development of domestic technological options in energy supply which will make it possible to avoid in the future our international vulnerabilities recently demonstrated so vividly in the energy crisis gas station lines.

At the National Bureau of Standards and elsewhere in Federal scientific laboratories, we are studying the merits of, and developing the potential for, increased utilization of coal, oil, natural gas, nuclear fuel, and solar radiation in this effort to reestablish the self-sufficiency of our nation's energy supply.

State and local governments must plan far into the future for their citizens' energy requirements. They must make these plans with an understanding of the several and growing number of energy options and their drawbacks. These governments must choose sites of power facilities appropriate to environmental, growth, and other concerns. In short, they must implement these new technologies for the public good.

However, energy needs cut across the fabric of society. And all of the government must weave the diverse threads of energy industries and consuming sectors—private citizens, commerce, and industry—into cloth of a common purpose.

There appears small chance of closing the gap between domestic supply and demand unless growth of demand can be restrained. Energy conservation by improving the efficiency of manufacturing processes must be increasingly practiced by industry. Public services delivered by local and Federal Government, such as transportation and housing, must be planned with conservation of energy as a major objective for public benefit. Again, a partnership of all levels of government and industry towards meeting our common goal is the mechanism for achieving that goal.

Another instance of Federal action, also international in scope, is the accession of the United States to the International Organization of Legal Metrology (OIML). We are negotiating with other nations—developed and developing alike—to arrive at international standards of weights and measures.

This international harmonization of legal requirements in the general areas of measuring device performance and the assurance of protection against economic fraud (as Mr. Athâne later

will be discussing) will help each state to look with its industries towards markets not only with other states but with other nations.

Let me give you another example of federal partnership provided by another organization in my secretariat. Senator Inouye of Hawaii requested information from a number of government sources in 1971 asking whether proposed national communication satellite systems adequately addressed the communications needs of his state. The senator considered the response received from the Office of Telecommunicaitons to be most useful in his inquiry.

Also in 1971 the Governor of Alaska asked the Director of the Office of Telecommunications for analytical assistance on numerous issues relating to telecommunications for his state. The Office of Telecommunications made a significant contribution by helping institute long-range planning and management required to satisfy Alaska's emerging needs as a developing frontier state rapidly advancing to a position of great national importance.

Our nation's industries need and deserve this broad viewpoint; we must all—Federal, state, and local—cultivate it.

As a scientist and public servant, I see many of the nation's requirements, such as clean water, proper land use, law enforcement, traffic and mine safety, and disaster mitigation, for examples, being met with programs or components of programs which are products of science and technology. Yet, science and technology have not yet become central enough in the strategies of state or local governments. It is here, again, that a partnership is called for.

As I have indicated, effective, workable public service programs require that the state and local government officials who will be implementing these plans be participating in the design and organization of the programs. However, the problems do possess common elements which a central research focus is most efficient in handling. And, Federal laboratories represent huge central resources of science and technology—469 installations, an annual combined budget of approximately $7 billion, and major installations of more than 100 professionals apiece located in 32 states.

The Department of Commerce's laboratories and technical services are somewhat special in that they are quite experienced in interfacing and cooperating with state and local governments towards mutual objectives. In fact, as I mentioned earlier, the National Conference on Weights and Measures and its close relationship with NBS is a model which other Federal laboratories could well use in developing a working relationship with other levels of government in their own mission areas.

To help us work together, however, I must emphasize the importance of state and local governments identifying and articu-

lating their problems and needs in terms specific enough so that the resources of technology can be applied. For this, an ongoing communications and delivery system is essential. Development of this system is the role of such organizations as yours and a responsibility of everyone working in the commercial weights and measures system.

By promoting uniformity, you are setting standards of performance in both measuring devices and enforcement procedures. This standardization in state and local governmental requirements on a national scale aggregates the market to which industry can then respond. Few industries can invest funds to produce a product which only one or two states will buy or approve for sale in its jurisdiction. Therefore, through the activities of such organizations as the National Conference on Weights and Measures, you have developed an even larger partnership—government and industry working toward the public good.

In an effort to satisfy what appear to be emerging public needs, look into the future with me now:

NBS is working in areas which are aspects of what we used to call quality, but are being defined, measured, and, therefore, quantified for today and tomorrow.

There is work going on at NBS in consumer and government product performance and safety, flammable fabrics, and water and air quality, to name only a few—a far cry from custody of the standards of mass and length.

What I propose is that you at the state and local governmental levels have an opportunity and responsibility in such matters also. The traditional responsibility of state and local governments has been the regulation of the measure of goods and services bought and sold within the state. This is a basic public service which preserves the integrity of marketplace transactions in the United States today.

Still, within this traditional scope of weights and measures, you may already be confronted with commercial measurement problems far beyond your traditional measurements and assurance of mass, length, and volume. Accuracy determinations of clinical thermometers, of timing devices, or of instruments to measure moisture in grain are all part of your basic mission to insure equity in the marketplace. However, today's citizens are asking for more. Recent legislation is a barometer of that demand. The National Environmental Protection Act, the Occupational Safety and Health Act, and the Consumer Product Safety Act are all indicators of the public awareness that economics is not the sole factor in the quality of life.

However, implementation of these technologically dependent programs is often hampered by the absence of knowledgeable and capable agencies at the state and local levels—except for weights and measures. Your weights and measures departments are staffed with technicians and other professionals who understand the importance of measurement. You, therefore, have the opportunity, like NBS, to get involved in measurement of some aspects of the quality of life.

I have kept in mind that these additional responsibilities will require intense development and refinement of government's ability to manage its programs. Priorities and objectives will have to be set, resources allocated, and mountains of information and data properly utilized in arriving at these decisions. We in government are being called upon to improve our efficiency and ultimate productivity.

The overall standardization process in which you are involved now—the operating objectives of the National Conference on Weights and Measures—will do much towards attaining these goals. And, I know as part of this government partnership, the National Bureau of Standards will be working with you all to define, measure, and improve those fields of mutual concern which contribute towards equity in the marketplace.

EXPANDING THE NATION'S MEASUREMENT SYSTEM

by Dr. Arthur O. McCoubrey, Director, Institute for Basic Standards, National Bureau of Standards

It is a great pleasure for me to address this distinguished gathering of those who make our national measuring system work. Although I am rather new at weights and measures, I am not new to the general business of measurements. I enjoyed many years of participation in the industrial development of time and frequency standards and I well appreciate the great importance which measurements have for industry, science, and for the public at large. Therefore, I am pleased to represent Dr. Roberts, your Conference president, at this plenary session of your organization; and I want to express to you, for him, the continuing enthusiasm and good will which the National Bureau of Standards brings to its work with this Conference. I also want to say on behalf of Dr. Roberts how

pleased we are to be working with the International Organization of Legal Metrology.

I want to talk to you briefly about three things. The first is a detailed study of the National Measurement System of the United States which we have been carrying out in parts at the National Bureau of Standards for the last two years. We continue to ask ourselves serious questions about our role in expanding the Nation's measurement system, about the economic dimensions of this system, about the leverage of our work and about the details of our many programs. We have gained many new insights and I think that you will be interested in some of the findings.

As a second topic, I would like to discuss a few things about technologies in which you and we have a common interest. There is a variety of problems on which we ought to do our forward thinking together as we participate in the expansion of the Nation's measurement system.

And third, I would like to show you just a couple of the interesting results which our scientific work has led us into recently. These are pleasant spinoffs of measurement science—some of them exotic and others very practical.

I. THE NATIONAL MEASUREMENT SYSTEM STUDY

Our National Measurement System study is an outgrowth of some ideas which were described before this Conference in 1967 by Dr. Huntoon. By the National Measurement System we mean something very broad; namely, the network of measurement standards, instruments, procedures, institutions, and people that generate the base on which all day-to-day measurement operations are conducted at all levels of accuracy throughout the United States. The study is an effort to determine the organizational structure and the economic leverage of physical measurement activities and the purpose of the study is largely to guide us at the National Bureau of Standards in making more effective use of the taxpayer's dollar.

Our National Measurement System studies of the past two years have been carried out in two parts. The first part, a macrostudy, consisted of a look at the overall system in order to determine something about the economic dimensions. This was a study in economics carried out by an economist and the information which we used was taken from some detailed Department of Labor and Department of Commerce statistics. From these data it was possible to draw some rather broad estimates of how measurement related activities contribute to the gross national product of the Nation.

For example, the study indicated that six percent of the gross national product, or about 70 billion dollars, is generated by measurement related activity. Of this amount, about 20 billion dollars consists of value added to the gross national product by industries represented in the National Conference of Standards Laboratories. The cost of services provided by these standards laboratories throughout the Nation is 230 million dollars. These figures indicate, first, that measurement activity is indeed a large business; and, second, there is, in fact, a great amount of leverage in the services provided by standards labs.

For the second part of our intensive study, we divided our measurement activities into twenty-one areas and undertook a microstudy in each case examining each of the technical areas in fine detail. The microstudies were carried out by the people who are actually responsible for the work in each of the different technical areas. Data were collected by several different methods including visits to industry, special reports written by committees organized for the purpose, the reports of our National Academy of Sciences Evaluation Panels, and information from industry associations.

Our microstudies have provided us with many important results. For example, in the case of the Mass Measurement System we were able to determine that National Bureau of Standards' services are effectively available for all the identifiable users representing all levels of accuracy. We were able to get a feel for the large volume of commercial weighings with which your organization is concerned.

While our studies revealed that the Mass Measurement System is a mature measurement system with no important needs which are not satisfied, it is also clear that it is not a static subsystem, and many new developments will be required in order to maintain it. For example, data handling is expanding so rapidly in the area of consumer weighing and so many measurements can be made so fast that the consumer's whole relation to the information will be changed.

We are going to have to rethink our whole approach to measurements control in this area due to the rapid growth of automation in point-of-sale equipment. Your concern for this is reflected by an entire afternoon devoted to related topics during your plenary meeting last year. My friends in industry have recently shown me some of the new developments in automatic label reading equipment, and I am convinced that we will all have to work together very effectively if we are to meet these needs in expanding the National Measurement System.

In the case of length, we found that 80 percent of all industrial measurements involves displacement. While methods and standards for measuring length are adequate, there are important areas of application which require new development.

In some of our microstudies we found areas of requirements which we had not been aware of previously. For example, we learned that the surface finish on dairy pipes and containers is important to the inspector because he must be able to see by reflection that things are clean. We also learned that the surface finish on surgical implants is very important to avoid blood clotting and to insure compatibility with the body.

In several important cases, our microstudies revealed needs for which we do not now have adequate capability to provide services which are required. For example, in the case of humidity which Dr. Ancker-Johnson has mentioned, we discovered the real importance of large scale agricultural needs for the determination of moisture in grain; and we are now trying to find ways of helping the United States Department of Agriculture to solve this problem. We had a workshop on this topic recently with George Johnson of your organization, representing the state of Kentucky, and Edward Waggoner, representing the state of California.

Our National Measurement System studies are giving us some guidance on management questions including the allocation of our limited resources. For example, they help us determine whether or not we should undertake new measurements assurance programs such as the program which Mr. Cameron, of my office, and Mr. Harry Johnson, of the Office of Weights and Measures, are now carrying out on two-pound weights in cooperation with several state laboratories which have received the NBS sets of masses.

We still have many steps in this study to complete including the development of meaningful methods for determining the economic value of each of our many services in the society. Our intensive study of the National Measurement System has established a much closer relationship between the staff members of the National Bureau of Standards and the users of our services. This is very much becoming a way of life, and it is indeed a healthy one.

These studies give us a picture of the National Measurement System as a vast corporate structure, having private elements as well as government elements at the federal, state, and local levels. I suggest that we should all regard NBS as the central research and development facility for this complex National Measurement System, providing central standards, undertaking

special projects of broad common interest and providing the new measurement technologies for those who are responsible for the delivery of measurement services. Our role in the government partnership described by Dr. Ancker-Johnson, as well as our response to the trends of "New Federalism," seems clear within this context.

II. NEW DEVELOPMENTS IN TECHNOLOGY

Now I would like to talk about some developments in new technologies which are important at NBS and which I think will be of special interest to you. These are areas in which our joint efforts will be essential in the near future.

A. We have recently entered into a contract with API for an extensive project—measuring the densities of crude oil samples from 175 fields around the world. These fields account for 80 percent of known international reserves and production. All samples will be measured by a common controlled technique, with enough repeat measurements to characterize the variability both of the substance and of the measurements. The API selected NBS because of our extensive experience with international measurement standards. I see that Harold E. Harris, from the Exxon Company and from API, will be speaking tomorrow on related questions in connection with petroleum products at retail.

B. You may recall that in 1971, Doug Mann, LNG Program Manager of our Cryogenics Division, addressed the NCWM on cryogenic fluids. Since then a new code for cryogenic fluid metering has been adopted on a tentative basis as part of Handbook 44; and NBS cryogenic fluid and fluid metering programs have been concentrating increasingly on liquefied natural gas, and especially on ways to measure its heating value accurately, when it is loaded on or off tanker ships. The problem is that LNG is a mixture of fluids which evaporate at different rates during an ocean voyage; at the off-loading dock, where enormous volumes must be pumped at high speed, the mixture is not the same as that originally loaded into the tanks. As much as $30,000 worth of heating value may be at stake in a single shipload. NBS is trying to help this situation by providing better means for using flowmeters and better methods for verifying the heating value of the mixture with calorimetric sampling. The project is sponsored largely by the American Gas Association.

C. Now to change to a different subject, I would like to illustrate how NBS is helping with a new problem connected with pollution, which is something that the state members of this audience are going to be seeing more and more in the near future.

The Environmental Protection Administration has asked us to help them in establishing uniform methods of measurement for pollutants in the atmosphere. Figure 1 shows a tiny glass critical-flow nozzle, which we have provided for their laboratories to enable them to sample air at specified intake rates. Figure 2 shows a scheme for mixing standard polluted atmosphere under controlled conditions. Figure 3 shows how we do this with controlled leak valves. By attaching sulfur dioxide to one inlet and compressed air to the other, the user has only to read the two pressure gauges to know what mixture of standard pollutant gas he is delivering to his test rig. Figure 4 shows this assembly ready to work in an EPA test lab. And finally, we are also looking into methods for measuring exhaust flow rate from a car tailpipe (figure 5). This turns out to be pretty complex; and the presently recommended apparatus is larger than the car.

FIGURE 1

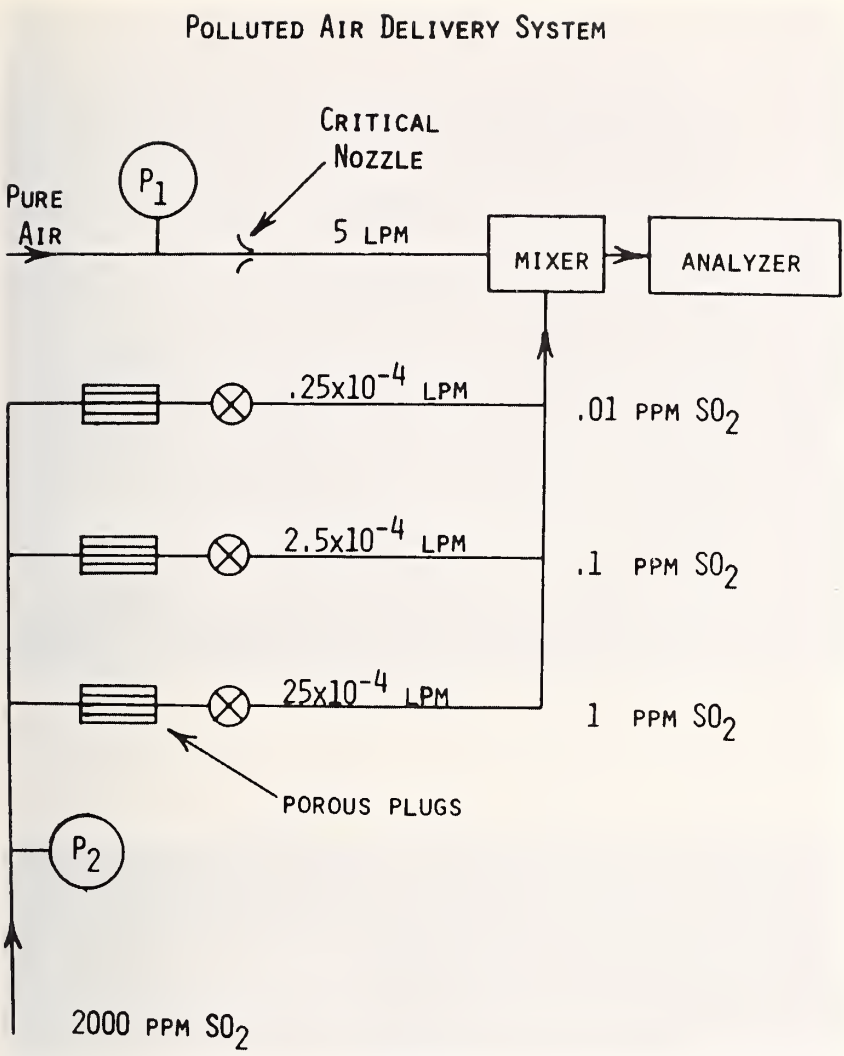


FIGURE 2

D. Turning now to Monsieur Athané's area of international legal standards, we are cooperating with the Conference on several "Pilot Secretariats" for the International Organization of Legal Metrology, especially Secretariats 7 and 8 on Masses and Weighing, respectively. My own office, in the Institute for Basic Standards, will provide, through Dr. Chester Page, Pilot Secretariat 13 on Measurement of Electric and Magnetic Quantities and, through Mr. J. M. Cameron, Pilot Secretariat 22 on the General Principles of Measuring Instrument Verification.

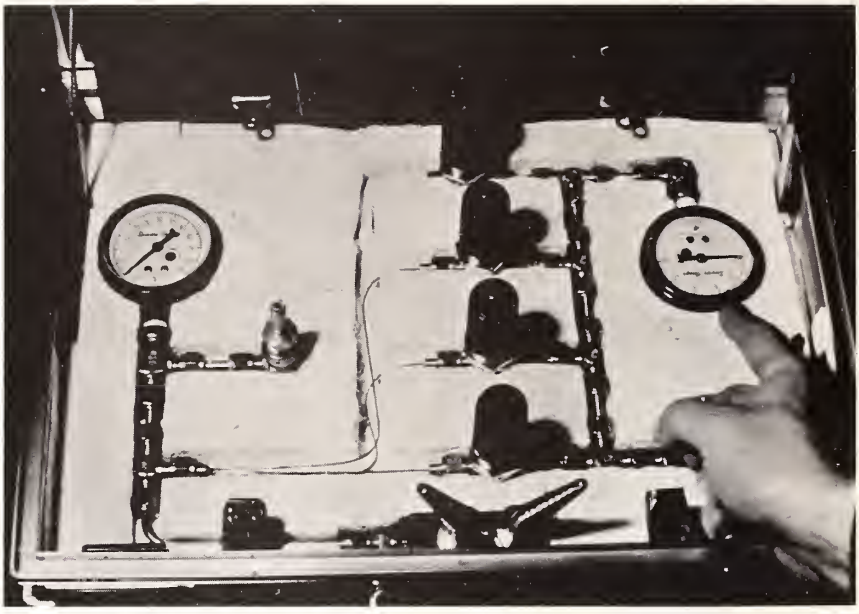


FIGURE 3

FIGURE 4

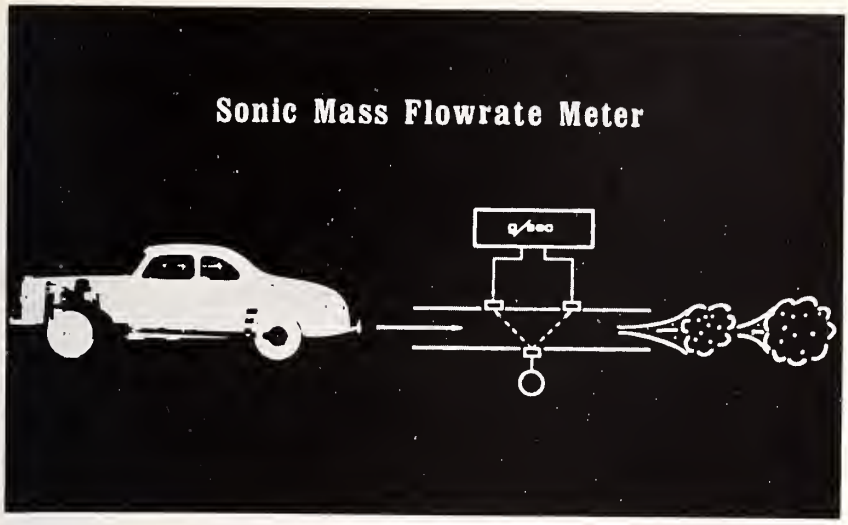


FIGURE 5

III. SOME RECENT NBS SCIENTIFIC SPINOFFS

Next I would like to tell you about some of our more exciting recent accomplishments which do not necessarily demand our joint efforts in the near future. A few days ago, NASA launched a satellite which will soon be turned over to the National Oceanic and Atmospheric Administration for their weather service programs. This satellite provides a high frequency channel by means of which we will be able to send out a new time and frequency broadcast signal. The coverage of this new broadcast signal is wide and reliable—it will be received more easily and more accurately than the signals from our present stations, WWV and WWVH. We have tested the broadcast channel, and it works! This is just the beginning of a new form of service that should ultimately replace our famous earth-bound stations which have been operating for more than fifty years.

Next I will mention a result which is "far out" in many respects. As you know, NBS is very highly skilled in the interpretation of emission and absorption spectra. This skill has recently been applied to millimetre wave signals coming from the direction of the Orion Nebula molecular cloud and dimethyl ether has been identified by its emissions at 90.9 and 86.2 GHz.

This molecule, with two methyl groups, is the most complex molecule ever detected in interstellar matter. The discovery indicates that large organic molecules have indeed been produced out in space in sufficient quantities to be detected. The observed

spectra, although complicated, are amenable to analysis; and they give hints as to the environment in which the molecules find themselves. The result may have an important bearing upon the question of life in other parts of the universe.

To close, I would like to give you a little bit of a fish story. The state of Washington, under the sponsorship of the National Marine Fisheries Service, has placed with NBS a couple of projects for the large scale mathematical modeling of the Pacific Coast salmon hatcheries and fisheries. This is big business in the state of Washington; the annual yield is thought to be over 100 million dollars, when both commercial and sport fishing are considered. Dr. Fred Johnson, the NBS mathematician conducting this research, came to NBS from the state of Washington.

The problem is to augment the hatchery-supplied fraction of the catch, which as we see in figure 6 is a good half of the total.

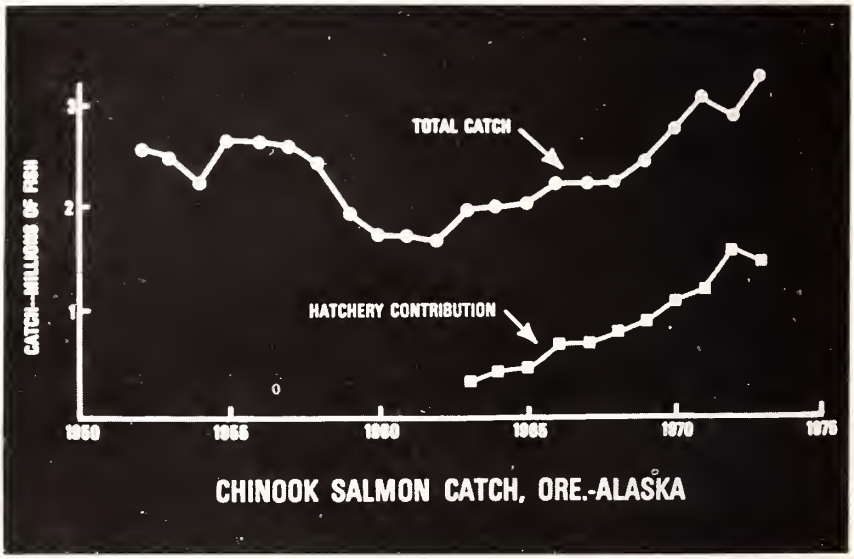


FIGURE 6

The hatcheries are constrained by the amount of water they have available through the breeding season; and the schedule on which they let out one year's crop of salmon youngsters, and start the following year's, turns out to be very critical. Figures 7 and 8 show a before-and-after approach to the timing of raise and release and the improvements in the cycle which Fred Johnson recommends. At about $10,000 of increased hatchery costs, it is possible to produce a salmon crop for which a million dollars' more value winds up in Washington State—so this is a very good bargain for the state.

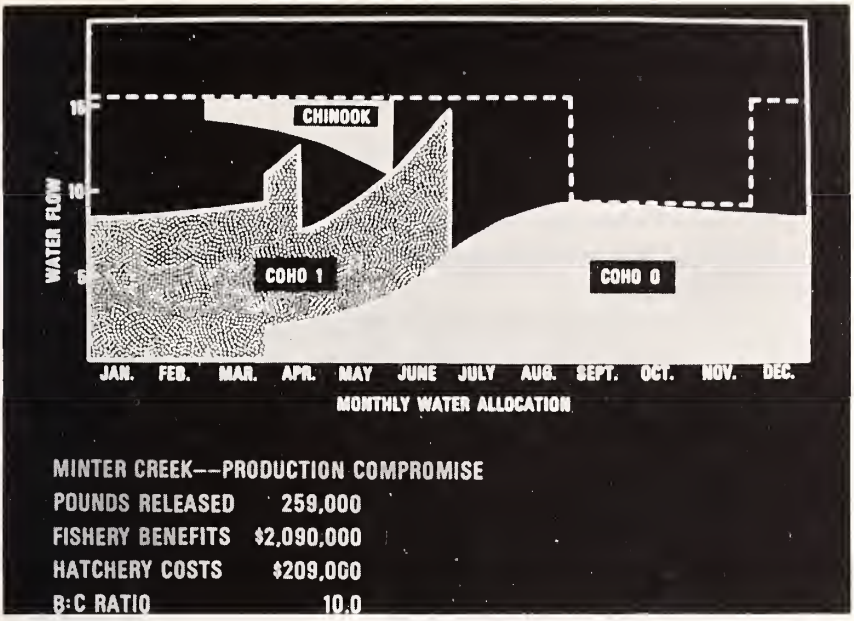


FIGURE 7

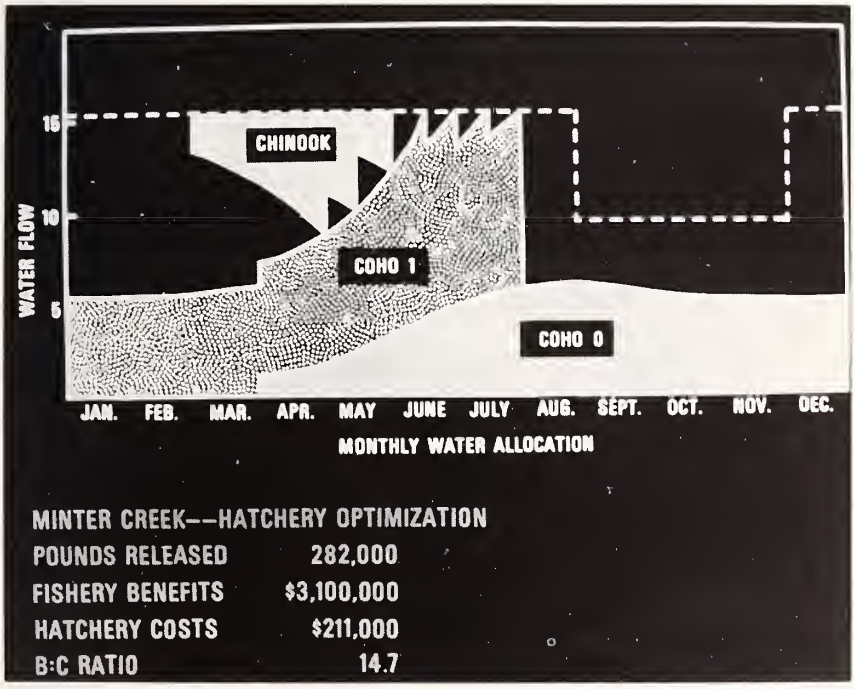


FIGURE 8

Next we see the sort of answers which come from the hatchery modeling—they are many and varied. A very interesting follow-on is what happens to the salmon in the coast fisheries. The salmon leaving the river may turn north and go to Canada; or with careful timing and a little coaxing, they can turn south and wind up on a U.S. hook. A most difficult feature of this fisheries problem is to insure that the Indians can take from the fish crop the full half of the fish passing their shores—this is a matter of long standing treaty rights.

And finally, I show you Fred Johnson himself; and you see why he is interested in the whole matter (figure 9).

FIGURE 9

It is now my privilege to announce the appointments for service on the four Conference standing committees. The individuals appointed to these committees have all had considerable experience in the field of weights and measures and in the work of this Conference. I believe they fully understand the obligations and opportunities of standing committee service. We are grateful to them and to the outgoing committee members.

The appointment of new committee members is as follows:

Committee on Specifications and Tolerances:

Mr. James R. Bird, Deputy State Superintendent of Weights and Measures, Department of Law and Public Safety, State of New Jersey, is appointed for a five-year term to replace Mr. Trafford F. Brink whose term is expiring.

Committee on Laws and Regulations:

Mr. John T. Bennett, Chief, Weights and Measures Division, Department of Consumer Protection, State of Connecticut, is appointed for a five-year term to replace Mr. Sydney D. Andrews whose term is expiring.

Committee on Education, Administration, and Consumer Affairs:

Mr. William H. Korth, Director, Weights and Measures, Consumer Affairs, Ventura County, California, is appointed for a five-year term to replace Mr. Earl Prideaux whose term is expiring.

Committee on Liaison with the Federal Government:

Mr. C. G. "Joe" Gehringer, Vice President of Operations, Pennsylvania Scale Company, Leola, Pennsylvania, is appointed for a five-year term to replace Mr. Arthur Sanders whose term is expiring.

PRESENTATION OF HONOR AWARDS

Dr. McCoubrey presented Honor Awards to members of the Conference who, by attending the 58th Conference in 1973, reached one of the five attendance categories for which recognition is made—attendance at 10, 15, 20, 25, or 30 meetings.

25 Years	
W. E. KERLIN	American Petroleum Institute
W. W. WELLS	Formerly District of Columbia
20 Years	
B. S. CICHOWICZ	South Bend, Indiana
15 Years	
W. E. CZAIA	Minnesota
10 Years	
N. BUCUR	Lake County, Indiana
E. M. BURNETTE	Formerly National Bureau of Standards
D. B. COLPITTS	General Mills Inc.
G. L. DELANO	Montana
F. A. DOBBINS	Quaker Oats Company
M. GREENSPAN	Formerly New York City, New York
S. HASKO	National Bureau of Standards
L. J. MOREMEN	International Nonwovens & Disposables Association
A. A. MULLIKEN	Chemical Specialties Manufacturers Association
J. L. O'NEILL	Kansas
W. R. SEVIER	Gibson County, Indiana
J. C. STEWART	Virginia
S. F. VALTRI	Philadelphia, Pennsylvania
E. E. WOLSKI	Colgate-Palmolive Company

AWARD OF APPRECIATION TO MR. ARTHUR SANDERS

Mr. Arthur Sanders, who recently retired as Executive Secretary, Scale Manufacturers Association, was presented an award for his many valuable contributions to the National Conference on Weights and Measures over a period of 28 years.

Top photo: Mr. Wollin presents Mr. Sanders with a certificate of appreciation which reads:

> In appreciation for service rendered to the
> National Conference on Weights and Measures
> and to weights and measures administration
> nationally

Bottom photo: Mr. Wollin presents Mr. Sanders with a National Conference on Weights and Measures medallion commemorating the signing by President John Adams of the first weights and measures law in the United States on March 2, 1799.

INTERNATIONAL DIPLOMACY IN WEIGHTS AND MEASURES

by Bernard Athané, Director
International Bureau of Legal Metrology

It is for me a real pleasure and honor to attend and address the 59th National Conference on Weights and Measures. The relations between the National Conference and our International Organization of Legal Metrology (OIML in its French abbreviation) have always been real and friendly.

Let us always remember some important dates of this collaboration:

- In 1937 Dr. Crittenden, assistant director of the National Bureau of Standards, was the U.S. delegate at the First International Conference of Practical Metrology (that is the first attempt to create the organization, ruined by the international situation two years after).
- In 1958 Dr. Muhe of the Physikalisch-Technische Bundesanstalt (who is now the member of the International Committee of Legal Metrology (CIML) for the German Federal Republic); then in 1963 Dr. Stulla Gotz, Director of the Austrian Metrological Service and president of the CIML, addressed your Conference on OIML.
- More recently, we must remember the elocution in 1970 of Mr. Van Male, director of the Dutch Metrological Office and president of the International Committee of Legal Metrology; and in 1972 the address of Mr. Andrus, now United States member of the International Committee, only a few months before the U.S. joined our organization.

  At the end of his speech, Mr. Andrus said, "In conclusion, I would like to say we are over the first hurdle. We have come to an agreement within the Executive Branch of the Government that U.S. membership in OIML is desired and needed. The next hurdle is that of obtaining Senate approval, and early action on this is dependent upon the sense of urgency associated with this legislation."

Now, a little more than two years later, I can only say that, like a good racer, the U.S. has prepared itself so that it can pass all the hurdles which separated it from OIML; and that, carried

on by its enthusiasm, it is now becoming one of the most active countries in our organization, as can be seen by the number of pilot secretariats they hold.

It may well be true to say that until now OIML has been dominated by European countries. However, I feel that this time is past and perhaps now we may find it difficult to prevent OIML from being dominated by the United States!

I shall come back, at the end of my address, to the part that your nation can and must play in the OIML activities; but before this I would like to develop certain considerations about the international aspects of weights and measures.

Diplomacy is both the science and the practice of good relationships between countries. Diplomacy is conducted by representatives of the countries; and these representatives, by means of negotiations, try to reach agreements which will be accepted and implemented by the different parties.

In fact, OIML, like all intergovernmental organizations, is a diplomatic institution. We can examine how the diplomatic work which applies to a specific subject, that is legal metrology, can be done. This leads me to the different subject headings of my address:

- Who are the actors in the diplomatic activity?
- How can the negotiations be conducted?
- What must be the relations with other international institutions?
- How are the decisions to be implemented?

THE ACTORS

By definition, legal metrology is a governmental matter. In consequence, the principal participants in the negotiations are representatives of the legal metrology (weights and measures) departments. But, by a sort of paradox, it appears that the weights and measures officials are perhaps the least concerned with the modifications which can result from international agreement.

The people most concerned are, of course, the trilogy: manufacturers, users, consumers.

Let us have a simple example: Suppose that in some countries the maximum error tolerated on a meter used in gasoline pumps is 0.5 percent (under- and overregistration). Imagine that by an international agreement, this error is reduced to 0.2 percent. The manufacturer will be the first concerned, because he will be obliged to review the conception of his meters—adjusting device,

tightness, and so on—in order to improve the metrological characteristics of his product. Then the user will no longer be able to have his pump adjusted to take advantage of the 0.5 percent error to compensate perhaps for losses such as evaporation or leakage, or to increase his profits. The consumer, finally, should be quite happy since he pays a fairer price for the gasoline he uses, although he may not be aware of this!

For the weights and measures official, the work will not be changed at all. The pattern approval procedures and testing in the field will be carried out with the same standards and testing equipment; only the tolerances will have changed.

As they are not personally involved, the weights and measures officials are able to represent impartially their national interests; that is, the sometimes conflicting interests of their manufacturers, users, and consumers.

Of course, we must not be too formal on this point and it is not essential that the representative of a country in an OIML meeting be always a government official; he can, for example, be a member of a manufacturers association. But in that case, he is not the spokesman of his association but of his country as a whole.

I do not feel I need to dwell on this point. I can only admire the logical and realistic way in which you have undertaken the creation of national committees which are entrusted with the definition of the U.S. national point of view in regard to OIML studies, according to the interests of U.S. manufacturers, users, and consumers.

THE NEGOTIATIONS

It is obvious that a few hours of discussion are better than a long exchange of letters and documents. That is why most of the progress in the technical work of OIML is made during meetings in which the reporting secretariat (that is, the weights and measures department of the country which has accepted responsibility for the study subject) and the collaborating countries meet together. At these meetings the spirit of compromise fundamental to negotiation must prevail if valid decisions are to be reached.

It is not necessary for me to say much about these meetings because they are all very similar and especially since the United States has participated in nearly all the OIML meetings since they joined our organization. But, I would like to point out some difficulties connected with these meetings, and which hinder the development of OIML work.

In many countries, weights and measures departments are very small government institutions with just enough officials for their

own national work. We must consider that participation in OIML work is a sort of overtime which, in its turn, does not reduce the national work in an appreciable manner. Perhaps, I could make a comparison with the field of standardization.

You know, perhaps, that the Danish Standardization Institution has decided to stop its national work so that it can devote all its activity to international standardization. In doing so, the Danish Standardization Institution has not abandoned its national responsibilities; the Danish standards will simply be issued through international standards.

In the field of legal metrology, such a solution is not possible because the legislative work of weights and measures departments is only a small part of their activity, the main part being the various technical operations of pattern approval, ispection, and testing.

In consequence, the organization of a technical meeting is a heavy charge; and secretariat countries cannot undertake this too frequently. This is one of the explanations of the slowness of the OIML activities.

Another difficulty, for certain collaborating countries, is the financial impact of the meetings. You know how expensive journeys from one country to another are today; and very often, for this reason, weights and measures departments cannot properly fulfill their role as collaborators in a working group. Because of this, a large part, too large in my opinion, of the OIML technical work is done by correspondence. I strongly hope that the creation of pilot secretariats will remedy these difficulties by better coordinating the work and by making it possible to hold at the same time connected meetings of their reporting secretariats.

The last point under this heading I would like to mention is the problem of communication; that is, language. You know that the only official language in OIML is French, although any major language may be used during working group meetings. In addition, I would like to asssure you that I strongly favor the setting up of a translation center which will provide the English speaking member countries with translations of all the letters, drafts, recommendations, comments, and other international documents, etc., produced by our organization.

RELATIONS WITH OTHER INTERNATIONAL INSTITUTIONS

I can class the international institutions with which OIML is in relation into two categories:

1. International institutions without specific technical aims, for which OIML can play the role of technical adviser; and
2. International institutions with technical aims connected with those of OIML.

In the first category there are, for example, some economic or political institutions—like the European Economic Commission of UNO, the Customs Cooperation Council, and also the institutions concerned with the industrial development of developing countries.

I can say that the work of these institutions does not really overlap with ours, but they can use our organization as technical adviser, for example, to provide them with international documents they can use or to give valuable information about legal metrology.

This activity of technical advisers will increase in the future, particularly for developing countries for which a special department has been created inside the Bureau.

The second category is composed of international institutions which deal with measuring instruments either from the technical point of view (particularly the standardization institutions—ISO and IEC) or from the legal point of view (for example, the Common Market and the Mutual Economic Assistance Council).

The international standardization institutions have, of course, a lot of work to do on measuring instruments. It is necessary that this standardization work be done in close cooperation with our organization and, conversely, that OIML work be carried out with the participation of these institutions to save time, undesirable overlapping, and publication of contradictory international documents.

Concerning ISO and IEC, you know that agreements were signed several years ago between OIML and these institutions but these agreements were general. It has not been found possible to define precisely the frontiers between standardization and legal metrology. In fact, no general principles can be laid down which make it possible to draw these frontiers exactly.

In my opinion, it is necessary to examine, for each instrument, the possibility of reaching an agreement about the repetition of the responsibilities of the different organizations.

As a guideline for that repetition, we can take the fact that OIML recommendations must deal with the metrological performance of measuring instruments, protection of all parties against fraud, and give some prescriptions about pattern approval and testing in order to obtain international harmonization of the legal requirements of the different member countries.

It is possible that some technical characteristics of the instruments may influence their metrological performance. In such a case, it is necessary for our organization to deal with these special technical characteristics; and there is a possibility here of overlapping with standardization work.

I can say that the relations between OIML and the standardization institutions are making good progress through a systematic study of the subjects of common interest, by a mutual participation in meetings, and in the elaboration of documents.

It has been suggested that national weights and measures departments and standardization institutions join together wherever possible to define their national position in regard to OIML draft recommendations and international draft standards.

Of course, it is clear that good relations at the international level between legal metrology and standardization are conditioned by good relations at the national level. I would like now to say a few words about the relations between OIML and some international institutions which deal with measuring instruments from the legal point of view. I shall take as examples the European Economic Community (or Common Market) and the Mutual Economic Assistance Council.

You know that one of the aims of these regional institutions is to harmonize the legal requirements of their member countries in order to facilitate the circulation of goods. Of course, measuring instruments are one of the objects of this harmonization. For example, the Common Market issues directives which must be implemented by its nine member countries. These directives give the metrological and technical requirements with which the measuring instruments must comply in order to be submitted successfully to European type approval and initial verification. In this way an instrument which has been approved and verified in one Common Market country will be accepted by the other countries.

You understand the usefulness for OIML to have close relations with these regional institutions. Where these regional directives or requirements are in conformity with OIML recommendations, this makes it possible for the recommendations to be automatically implemented, in an indirect manner, in the national regulations.

I now come to the last item of my address.

THE IMPLEMENTATION OF THE RECOMMENDATIONS IN NATIONAL REGULATIONS

As is said in the Convention establishing the International Organization of Legal Metrology, the member countries are mor-

ally obliged to implement the decisions of the Conference as far as possible. This applies to financial and political decisions of the Conference but also to the international recommendations, which are always submitted to the approval of this highest authority in our organization, even when they have already been adopted by the International Committee.

Of course, there is neither enforcement by the Conference of the adoption of the international recommendations, nor penalties against refractory countries. We feel that the moral obligation is strong enough, and the member countries understand the interest they have in following the international decisions. However, the moral obligation is attenuated by the words "as far as possible."

In order to understand this point thoroughly, we have to remember that the philosophy of legal metrology differs widely from one country to another. In some countries almost all measuring instruments are covered by legal requirements; in others, only a small number of instruments, and then only when they are used in specific conditions (such as for commercial transactions), are covered by official regulations.

It is not the purpose of OIML to obtain complete uniformity of all weights and measures legal requirements in its member countries. "The hate of uniformity is the first mental health," as Einstein said, I think. Let every country keep its own specific conception of legal metrology, according to its historical and economic situation.

The main purpose of OIML is to reduce the divergences existing in national legislation in order to facilitate trade and to diminish the administrative barriers between countries. In that connection, I can say that when there are legal requirements in a country for an instrument which is covered by an international recommendation, that country has the moral obligation to change its regulations in order to make them compatible with the recommendation.

If a country decides to publish legal requirements for that same instrument, the new legislation should be in conformity with the recommendation. But if a country has no legal requirements for the instrument, there is no obligation for it to implement the recommendation.

Does this mean that countries in which only a small number of instruments are covered by regulations are not concerned with the whole of OIML work? Of course not.

Firstly, the participation in OIML meetings of delegates who are not directly concerned at their own national legislative level with the results of the work is of importance because these dele-

gates can contribute pure and impartial technical ideas to the discussions.

Again, it is very useful that the recommendations are circulated among all the manufacturers concerned so that they can get to know about the metrological basis of the regulations which exist, or are likely to exist, in other countries. Also, if they wish, they will be able to comply with these international requirements to a greater or lesser extent by means of voluntary standards or specifications. In this way, one of the aims of OIML will be indirectly reached.

To conclude, I would like to give you briefly some personal considerations about the role of the United States in OIML.

I know that you have not joined OIML solely for the unproductive pleasure of being a member of one more international organization. Your accession has been based on a careful study of the economical impact of your participation. I consider that fact as a proof, as far as this may be needed, of the importance of our organization.

I have said previously that wide differences exist in the philosophy of weights and measures between different countries. In fact, your system is quite different from that which exists in the majority of other member countries.

I am sure you know that in chapter 4 of Handbook 82 there is a paragraph dealing with foreign organizations which underlines the extensive centralization of the legal metrology departments of many foreign countries.

In order to ensure that our international work of collaboration produces good results, it is essential that we all have a good understanding of the weights and measures methods in other countries. For this purpose, the OIML "Bulletin" is at your disposal to enable you to show your conception of legal metrology, the differences which may exist in your different states, and the coordinating activity of the National Bureau of Standards. These matters will be of considerable interest for other countries.

Conversely, the Bureau, with its documentation center, the development of which we are working on, will do its best to give you all the information you need about foreign countries.

The United States now holds five pilot secretariats. I consider it to be a sign of your deep-rooted implantation in OIML that besides your responsibility for a pilot secretariat on "Measurement of Pollutions," which is rather a new field in legal metrology, you have considerable activity in the old classical weights and measures—weighing instruments, for example; instruments which are always improving, which now give the price of weighed

goods, deliver tickets, and the importance of which in the marketplace is always increasing.

It is very important that your country participate as widely and actively as possible in the work of our organization. Both OIML and, if I may be allowed to suggest, the United States will benefit considerably from this participation. Your country, with its advanced technical know-how and original methods in this field, can do much to make our international documents even more international. We think that we, in our turn, can offer much that is of value to you and we look forward to continuing and increasing cooperation.

Finally, Mr. Chairman, ladies and gentlemen, I would like to thank you for your invitation and your kind attention; thank you for your activity in OIML.

AFTERNOON SESSION—TUESDAY, JULY 9, 1974

(GEORGE E. MATTIMOE, *Vice Chairman,* Presiding)

OBSERVATIONS ON OUR MUTUAL OBJECTIVES

by H. F. WOLLIN, *Executive Secretary,* National Conference on Weights and Measures

(Over 70 slides were shown during the presentation of this paper.)

INTRODUCTION

Occasionally, I will read through some old reports of the National Conference on Weights and Measures to see what action had been taken on a particular matter. This research often leads me back many years, sometimes to the very beginning of the Conference in 1905. It is always a fascinating experience to review these reports, to read what people were saying about the programs and problems in those years, and to study what action was taken by the Conference. For those of you who have not yet looked over some Conference reports of yesteryear, I recommend you try it sometime.

One of the amusing, and sometimes frustrating, observations I have made concerning the past is that people were saying pretty much the same things back 10, 20, and even 50 years ago as we hear today—and about problems that were not too dissimilar from those we face today.

For example, let's go back fifty years to remarks made by the Secretary of Commerce, Honorable Herbert Hoover, who addressed the 17th National Conference on Weights and Measures on May 29, 1924:

> "Gentlemen, I am very glad to have the pleasure of . . . welcoming this conference at the Bureau of Standards. . . .
> "The original purpose of your . . . work, of course, was limited to the inspection of standards of weights and measures as a matter of the public's protection against fraud. Herein lies a very great principle which has only begun to be recognized in its wider vision throughout our entire commercial fabric. That is the great principle that it is impossible even to establish ethical practices or standards of conduct without a definition of the standards themselves. There is no way by which right or wrong can be maintained in the vast processes of trade and exchange unless there are precise standards, and, with the development of science and the enormous

development of industry . . . we must determine some accurate bases before we can have a determination of the vital principle of right and wrong. . . .

"Your particular offices in the States . . . have in many instances been expanded in order to take account of this enormous development in service and industry. Some of you already have . . . problems of testing . . . (devices) of various kinds. Sooner or later you will be confronted with the problems of determining standards of quality. . . .

"I should like to see the time come, a thing which we cannot expect overnight, but it should be in our plans, when our commissioners of weights and measures shall be not solely inspectors of minor questions of weights and . . . (measures), but when they shall have behind them a trained scientific staff and a certain amount of laboratory development . . . for better organization of their work. . . ."

Well, then, I am sure these remarks of Mr. Hoover sound familiar. They also help to point out that some of the problems in weights and measures are long standing, or reoccurring, and they may be difficult, if not impossible, to solve quickly or completely throughout the nation. Some of the problems or issues I am referring to were covered in my talk to the 57th National Conference in 1972, which was titled "The Future is Now." I would like to briefly reflect on some of my views at that time:

1. I said then: "It is time for weights and measures administration to be duly recognized and adequately supported at all levels of government."

Comment now: We have seen some improvement, but have a long way to go.

2. I said then: "It is time for weights and measures programs to be placed near the top of the consumer movement spectrum."

Comment now: This has and is happening in many jurisdictions.

3. I said then: "It is time for weights and measures officials to understand that they would find it difficult to justify the maintenance of their programs on the basis of the status quo."

Comment now: Same view, only stronger.

4. I said then: "Weights and measures officials must be prepared to get involved in new programs in which their measurement expertise and enforcement qualifications can be put to effective use to achieve new goals and to meet the growing need for more efficient and equitable measurement control in commerce."

Comment now: Many weights and measures organizations are developing new approaches and expanding their measurement services to keep pace with advances in technology and commerce.

5. I said then: "To meet the demands for more effective and efficient government, we must apply sound management techniques to maximize the use of our resources and to prove the benefits of our effort."

Comment now: Is the same.

6. I said then: "Weights and measures technology will continue to take on greater sophistication, which will require new methods and requirements, but care must be taken not to impede innovation."

Comment now: The need today is even greater.

7. I said then: "A new trend is developing in which business and industry must be aware of, and assume full responsibility for, compliance with weights and measures laws and regulations. Weights and measures inspection is changing from a service mode of operation to that of regulatory supervision."

Comment now: This policy is growing throughout the United States, and many new programs for its implementation have been established.

8. Lastly, I said then: "Let's awaken the American public to the virtues of weights and measures people and their work for they will need us more than ever as America goes metric . . . and increases its relations with other nations in the field of metrology."

I see no need to comment on this last point.

What I would like to present now is an overview of the program of the Office of Weights and Measures (OWM). There are many things to show and tell you about concerning our mission. Unfortunately, time will not allow me to cover all the activities we are engaged in; and I will also skip over some of our activities that will be discussed later during this Conference.

OWM MISSION

Briefly, our goals are to provide the leadership and technical resources to weights and measures officials which will assure accuracy in commercial quantity determinations, promote new technology, remove impediments to the free flow of commerce, and maintain an effective and uniform system of weights and measures laws and methods of inspection. Simply said, we are in business to help you.

STANDARDS AND LABORATORY PROJECT

We are happy to report that on June 12, the State of Colorado became the forty-second jurisdiction to be formally presented with a new set of weights and measures standards and laboratory instruments. The standards were presented to Colorado Governor Vanderhoof by Dr. Richard W. Roberts, Director of the National Bureau of Standards, during an impressive ceremony which

included the dedication of a truly outstanding new weights and measures laboratory facility.

I believe that most of you are familiar with the hardware that makes up the set of reference standards given to the states by NBS as a gift of the Federal Government. The standards will be distributed to 54 jurisdictions—which include the District of Columbia, Puerto Rico, and the Virgin Islands. In addition to the 42 presentations mentioned, our office has forwarded most of the standards to five other jurisdictions. Some of the last six states have notified us that plans for a laboratory are shaping up, and they hope to qualify for the new standards during the year ahead.

State program administrators realize that many of the instruments provided, and procedures recommended, are too complex to expect all officials to become versatile in their use. Consequently, one criterion in qualifying respective states to receive the standards has been dependent on the assignment of specific laboratory responsibilities to individuals selected for their skill as metrologists. These representatives become active participants in an OWM sponsored training effort designed to constantly monitor state laboratory capabilities. Our present efforts to provide the training service have become involved in an annual certification of the state laboratories. One qualification for certification is active participation in our Laboratory Auditing Program, commonly referred to as LAP. Ideally, LAP serves to review and comment on a constant flow of input data submitted by state metrologists.

During the past five years, OWM has worked with over 100 individuals in private sessions and small group seminars at NBS and throughout the United States discussing laboratory recommendations and procedures. We are delighted that this new technical competence has encouraged some states to use the laboratory facility as a focal point for the expansion of its measurement services and the maintenance of other reference standards. For example, the calibration of clinical thermometers in the State of Connecticut.

RAILWAY CALIBRATION PROJECT

The cooperation between the states and railroad industry exhibited at the National Conference on Weights and Measures last year, in resolving problems relating to railroad weighing marked the beginning of a new era for the NBS Railway Calibration Project. This development, coupled with a financial agreement between the Bureau and the Association of American Rail-

roads, has provided much needed resources and technical support for the project.

We are now better able to carry out our commitment to state governments and the railroad industry by testing the 18 master railway scales located throughout the United States and to calibrate standard test cars at our station in Clearing, Illinois. We will continue to conduct special tests of railroad scales and perform calibration of test cars in the field as circumstances allow. In this connection, we use, and can make available to others, three specially designed tank test cars for testing in-motion weighing systems.

Looking ahead, I see new and challenging responsibilities in the parameters of electronic coupled-in-motion weighing. Government officials and industry representatives must cooperate and work together as they have in the past to provide the information and data that are needed to develop, or refine, technical procedures and requirements in this area.

To help solve the mutual weighing problems facing weights and measures officials and the railroad industry, we have sponsored a series of seminars to keep all parties concerned with railroad weighing better informed. We have also participated in numerous discussions and meetings with regard to the work in this area by the Committee on Specifications and Tolerances. And, lastly, we hope that as a new member of the Scale Committee of the American Railway Engineering Association, we will be able to make a meaningful contribution to the goals of that important committee.

TECHNICAL STUDIES AND ASSISTANCE

We have been concerned with several phases of activity in the area of technical studies and assistance.

Our work in cryogenic liquid meter proving has been a cooperative effort with the California Division of Measurement Standards, the Compressed Gas Association, and NBS-Boulder. Two potential transfer standards were field tested over a two-week period last September in California. The results of these tests were promising, and more extensive field testing of the two reference standards over a three-month period has been initiated. The data collected will be viewed by NBS personnel in Boulder; and they will prepare a report outlining their conclusions concerning the performance of the transfer standard meters.

Now, significance extends beyond this research and development activity. This is a model for other cooperative studies among

NBS, the states, and industry. We are trying to develop a similar approach with respect to grain moisture meters and have been working with several states that are active in this area. For example, states that are exploring the approach of using grain samples of predetermined moisture contents for checking the grain moisture meters.

We have solicited the aid of the NBS Humidity Section and helped them arrange a workshop on the measurement of moisture in grain that was held at NBS last month. As a followup to the workshop, we recently sent to the states questionnaires which will serve as documentation for a proposed study by NBS in this area in the immediate future.

Moving on, we are developing a new handbook devoted to "The Examination of Mileage Measuring Devices.' It will include procedures for the calibration of fifth wheel devices and for testing rental cars and taximeters. In order to simplify simulated road test procedures used particularly in odometer testing, we have developed a photodiode wheel turn counter that will count the wheel turns without having to be physically attached to the wheels under test—thus resulting in considerable saving of installation time with each test.

As you know, the LPG Vapor Meter Code was removed from a tentative status two years ago; and there has been a definite need for the publication of a test procedure for these devices. Such a procedure is now being finalized and will soon be prepared for publication.

The revision of Handbook 67 has top priority on our list of objectives. You will hear from Dr. Carroll Brickenkamp on Thursday morning about our progress on the revision and developments surrounding this vital matter.

API RESEARCH ASSOCIATE PROJECT

Since April 1970, we have participated in the research project sponsored by the American Petroleum Institute at the National Bureau of Standards. The purpose of the program is to investigate weights and measures and petroleum industry needs and applications for metal volumetric field standards (provers) in the measurement of liquid hydrocarbons.

Based upon evaluations and research, equipment was designed and fabricated that is capable of calibrating meters at flow rates from less than 100 to 1,000 gallons per minute. The trailer-mounted system consists of 50, 100, 760, and 1,545 gallon metal provers. The large provers include provisions for top or bottom

loading, closed fill with vapor recovery, or open-to-atmosphere loading.

In January we conducted the cold weather phase of the field test program in Wisconsin, Maryland, and Virginia. The brave and hearty individuals involved with the field test program are Blayne Keysar of OWM, Bill Kerlin of API, and Joe Hine, API Research Associate. The warm weather phase of the testing program will be completed next month. A report including all data evaluation, testing procedure recommendations, and complete equipment specifications should be ready for distribution to weights and measures officials and petroleum industry representatives by the 1975 Conference.

PROTOTYPE EXAMINATION PROJECT

Several years ago we initiated a new project for the examination of prototype weighing and measuring devices used in commerce. This is a voluntary effort between NBS, the states, and manufacturers to insure the introduction of new devices that are in compliance with Handbook 44 and other established standards. From a slow beginning (six examinations the first year) the program has broadened, becoming one of major importance and impact. We now conduct approximately 40 examinations annually and, to date, have issued 225 Reports of Test.

Throughout the history of the National Conference, we have often heard stated "we are in a period of a rapidly expanding technology." It seems to us that this has never been more so than in the last several years.

Digital displays have been developed for virtually all measuring equipment. Measuring devices are no longer measuring devices but rather elements of a system. This is most evident in the conversion from a computing drum scale at the checkout stand of a supermarket to the electronic point-of-sale systems. Now, when a package is placed on a weighing element at the checkout stand, computers not cashiers take the tare, determine the net weight, "look up" the unit price, and compute the total price, printing all of this information on a cash register tape—all in fractions of a second.

We have conducted examinations on all types of equipment ranging from sophisticated point-of-sale systems to simple berry baskets. We have aided the manufacturers of vapor meters to metric conversion, and provided guidance to other manufacturers on many similar problems. We have invited state weights and measures officials to participate with us in the conduct of these examinations whenever possible.

Much of the equipment submitted for examination is evaluated in our laboratory at NBS. Recently, we examined a new slow-flow meter—not a meter to measure fuel oil in a mobile home, but a meter to be mounted under the hood of an automobile to measure gasoline consumption. This device will interface with another electronic piece of equipment to provide the driver, as he drives, a digital display of the consumption rate updated every .01 gallon.

The prototype examination project has aided us considerably in guiding the S & T Committee in the development of appropriate requirements for inclusion in Handbook 44. It will also be extremely beneficial in our work regarding OIML and other areas of our program.

FAIR PACKAGING AND LABELING ACT

A major activity of the Office of Weights and Measures involves our work under the Fair Packaging and Labeling Act.

One of our roles is to determine whether the reasonable ability of consumers to make value comparisons of any packaged consumer commodity is impaired by the undue proliferation of the weights, measures, or quantities.

A second role is to bring about the voluntary elimination of such undue proliferation. To accomplish this result informal package quantity standards and, in a few cases, formal Voluntary Product Standards have been developed with full participation by industry representatives. To illustrate what can be achieved through such effort, we can point to the reduction in quantities of packaged toothpaste from 57 down to only 5 easily recognizable tube sizes.

Current emphasis is directed to market surveillance activities to determine the level of compliance by industry with the established standards. Product categories are divided into three groups with data to be collected for each group every third year. Data obtained from each survey is analyzed and where a procedure is not being observed, industry representatives will be informed and encouraged to comply with the simplified quantity patterns. If noncompliance continues, formal inquiry into undue proliferation will be activated.

I would like to take this opportunity to thank those officials who have participated in our surveillance activities.

Another role of our office is to promote nationwide uniformity in consumer package labeling. The purpose of this effort is to facilitate the exercise of good judgment by consumers in the marketplace. Accordingly, liaison with state and local weights

and measures officials, and with representatives of agencies of the Federal Government, has been an activity vigorously pursued. This has resulted in a close alignment of the Model State Packaging and Labeling Regulation with appropriate Federal regulations. Official documents issued under the Act or impacting on the model laws and regulations continue to be distributed pursuant to our responsibilities.

Finally, a word about metric labeling. As you know, the required use of customary units is implicit in the language of the Fair Packaging and Labeling Act. This does not, we feel, reduce our responsibility to strive for uniformity in the labeling of packages in metric units. In fact, the situation regarding metric labeling is in a state of confusion and will get worse unless national policy and guidelines are established. Obviously, uniformity in metric labeling has been severely hampered with the failure of Congress to pass a metric bill. The latest bill which was voted on by the House of Representatives gave the Department of Commerce the authority to interpret and modify the SI system, and this implies the responsibility to issue guidelines for appropriate units, symbols, and conversion factors.

I firmly believe that the National Conference on Weights and Measures is the logical organization to take whatever action is needed to provide suitable metric packaging and labeling guidelines and with your help we shall do so.

TECHNICAL TRAINING

Our training project is, of course, the activity with which many of you are most familiar. Since its beginning over a decade ago, members of OWM have visited every jurisdiction at least once and many jurisdictions several times.

We will continue to conduct state training sessions, administrative and technical seminars, and field sessions. However, since resources are always limited, we must attempt to achieve the greatest coverage of our training with a minimum expense. To do this, we need your cooperation in implementing these most effective, cost-saving measures:

1. Schedule regional schools whenever possible. We have found that this is not only more efficient in providing broader coverage, but it also provides an opportunity for an exchange of ideas among jurisdictions .

2. Open the training sessions to manufacturing, service, and sales personnel. They need to be informed of their legal responsibilities and be instructed on H–44 requirements, test procedures, and the like. Our experience has shown that industry does appre-

ciate this opportunity; and it results in better understanding and compliance with weights and measures requirements.

3. Schedule your training sessions on a specific date, annually or biannually, to provide us the opportunity for better advanced planning.

4. Make your request for training at least three months in advance. We can then be more responsive, and this will also aid us in more efficient scheduling.

When these measures are fully operational, it will allow us to provide: (a) more training aids, (b) quarterly tech memos, (c) home study course revisions, and (d) metric training material.

This seems to be a good point to tell you about a new program we plan to set up. We want to provide the opportunity for weights and measures officials to work with us for periods of 3 to 6 months to aid us in the conduct of our programs. This plan would work similar to our research associate program with industry. Here, however, rather than industry representatives, it would be weights and measures officials as participants.

We know that in weights and measures there is an expertise that we can use for our mutual benefit in areas such as the development of training aids, the conduct of training sessions, technical studies, and prototype examinations.

Notification of this plan will be sent out as soon as final arrangements have been completed. However, let us know if you are interested at any time.

FOREIGN VISITORS AND GUEST WORKERS

During the past year OWM has cooperated with the NBS Office of International Relations by providing assistance and training for foreign weights and measures officials. We feel this stepped-up activity and increasing involvement with our overseas counterparts is in line with our responsibilities in the International Organization of Legal Metrology (OIML). This effort is also in keeping with last year's Executive Committe recommendation that the states assist NBS in matters involving visitors from other countries.

Over the past twelve months, we have had visitors in our office from Germany, Australia, Sweden, Finland, South Africa, Russia, and the Philippines. The duration of these visits was from a few hours to several days. The main topic covered was a detailed explanation of the weights and measures control system in the United States.

The most significant activity in this area was the development of a four-month training program for two officials from Ethiopia.

These gentlemen are from the Ethiopian Standards Institute and are receiving training under a program arranged through the Agency for International Development. Mr. Mekonnen Betru is Finance Division Head and General Administrator at the Institute; and Mr. Negussie Abebe is General Supervisor and Laboratory Metrologist for the Weights and Measures Section.

They have received instruction at NBS and in the states of Maryland, Virginia, and New Jersey. They have also had the opportunity to visit manufacturers and such business establishments as a bakery and a dairy. Effort was made throughout the program for them to observe and participate in all facets of a weights and measures inspection program, such as inspecting bread and meat, and testing small scales, large scales, and fuel oil truck meters.

Now the program is about completed, and Mr. Betru and Mr. Abebe will be heading home next week. They are in attendance at this Conference and would enjoy meeting and talking to as many of you as possible.

Well, that about wraps up what I have prepared for presentation today. As I said earlier, there is much more that we do, or that we are involved in, or that we have plans for, but I trust these observations have helped to update your knowledge of the programs of the Office of Weights and Measures and to show how they relate to "Advancing Measurement Assurance in the Marketplace."

And so to conclude, allow me to go back again fifty years to the Conference in 1924 and quote Mr. Joseph J. Holwell, Commissioner of Weights and Measures for the City of New York, who offered these remarks during a testimonial for Dr. Samuel Wesley Stratton, the first Director of the National Bureau of Standards and the first President of this Conference:

> "I do not know of any group of public officials who have done more to promote a higher standard of ethics in the business life of America than have the weights and measures officials of this country. They have been the pioneers in our states, in our cities, in our towns, in our villages, and in the sparsely settled sections of this country for the square deal in all transactions between the buyer and seller. They have labored . . . (long and hard) in the cause of promoting the introduction and the use of honest and accurate weighing and measuring devices in all merchandising. They have fought the fight; they have been the vanguard; and in their fight for honest weights and measures they have contributed immeasurably toward the highest standard of citizenship in the United States. They have invariably been men of character, possessing courage, honesty, integrity, and a love for their work."

WEIGHING THE FUTURE—A NEW CHALLENGE

by J. DONALD ZELAZNY, General Sales Manager,
Toledo Scale Division, Reliance Electric Company, Toledo, Ohio

I appreciate this opportunity to be with you and to participate in this 59th National Conference on Weights and Measures. I am going to make a few brief remarks about "Weighing the Future—A New Challenge."

My remarks are about technology in weighing, its rapid growth, and the challenge that it presents to industry and to weights and measures. Rather than providing answers or conclusions to these challenges—and they are really opportunities too—it is my intent to raise some of the basic questions that must be jointly addressed by industry and by weights and measures.

Let us begin with a brief look at the history of weighing. The ancient Egyptians were known to use an even-arm balance as long ago as 5,000 B.C. or 7,000 years ago. This device is still in use today and the principle is still used for precision weighing.

As long ago as 200 B.C., or about 5,000 years after the balance, the Romans developed the steelyard scale which uses an unequal lever arrangement. A small ratio weight can be used to balance a larger weight. This principle is also still in use today.

In 1830, or 2,000 years after the steelyard scale, Thaddeus Fairbanks patented in the USA a multiplying lever platform beam scale. This permitted large heavy objects such as wagons to be weighed conveniently and accurately. The load is balanced by moving a small known weight called a poise into position along a beam.

About 1900, or 70 years after the Fairbanks patent, the DeVilbiss fan scale was patented. Also, about the same time, Henry Theobald, the founder of Toledo Scale, patented the double pendulum dial scale.

In the 1940's the strain gauge was developed. This led to the load cell and the first electronic scales in approximately 1950, fifty years after the first double pendulum dial.

However, only since about 1970 has the electronic load cell scale made a major impact in weighing and it is destined to be the scale of the future. The availability of miniaturized, reliable, low cost, solid state electronic devices has provided the impetus. The rapid development of these electronic devices and circuits

continues to be the motivating force behind the growth for electronic applications.

The scale is basically an information instrument; it tells us how much. By well known means, we can convert how much weight to how many dollars. We can add directly connected printers to print out the weight and eliminate operator errors.

We can provide time and date and selective numbering devices. We can add controls, such as cutoffs or selective output signals proportional to weight, and tie the scale into increasingly complex control schemes. All of this is well known and old hat. So what about the future?

Precision load cells, reliable miniaturized electronic circuit and memory devices, digital readouts and other related developments are permitting the industry to make scales into truly wonder devices.

Installed today are electronic scales connected directly to, and interacting with, digital computers. We can weigh boxes of precut meat or other commodities in motion at relatively high speeds with electronic scales and digital computers and the results are legal for trade. (See figures 1 and 2.)

All sorts of data from the weighment can be instantly available at the weighing site and also at other sites many miles or even hundreds of miles away. With the proper developments, it is probable that in-motion speeds will be increased, improving efficiency and reducing costs. It is also probable that the concept will be expanded on a legal-for-trade basis for many other applications.

An electronic scale working with a digital computer and card reading device is used in a refuse disposal system (see figure 3), helping to reduce the costs of improving our ecology to a practical level. A driver's identification card is automatically read by an unattended card reader, a legal-for-trade weighment is made, and complete data and billings are instantaneously and automatically generated. By means of modems and telephone lines, these results can also be transmitted instantaneously to remote locations.

At last year's Conference the Universal Product Code (UPC) and electronic cash registers for supermarkets were widely discussed. This is a current topic of much interest. Several speakers referred to this development this morning. Installations of these systems are, in fact, being made as we meet here. In these installations where a checkstand scale is used, the scale is frequently tied into a digital computer for purposes of recording data.

FIGURE 1

In some system designs, the indication of weight is made on the electronic register rather than on the scale. Also in some, the indication or printout of price is the combined result of the weighment and of price information stored in, and computed by, the digital computer rather than solely a function of the scale.

In the near future, many of the functions now performed by an external computer or control device will be performed within the scale itself by means of miniature dedicated electronic computers.

Toledo Scale introduced its new 8300 automatic prepack scale in May of this year. It will be installed in supermarkets this summer. This is an all solid state load cell operated, digital read-

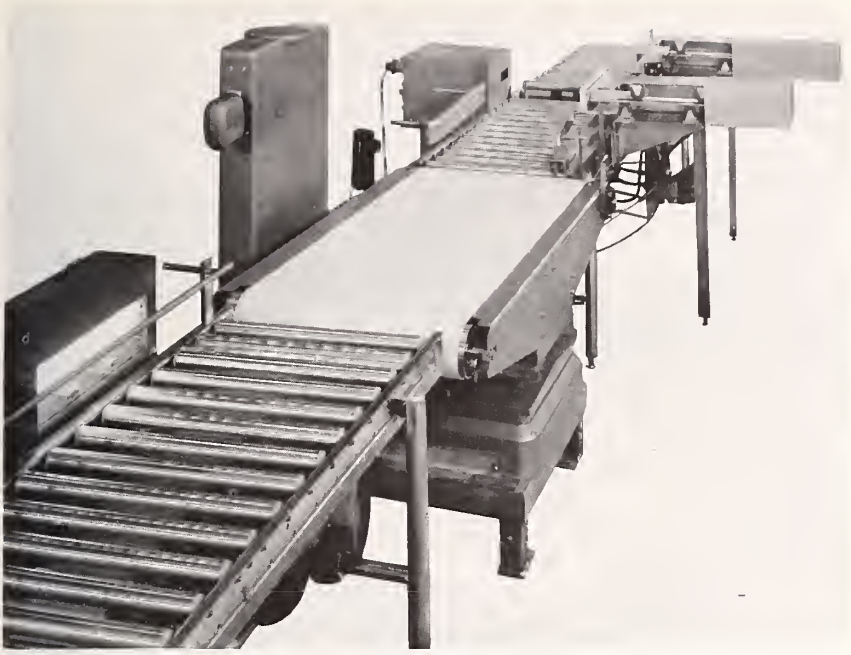


FIGURE 2

out scale with automatic or manual digital preset tare, automatic zero tracking to 0.0025 of a pound, and a built-in dedicated electronic digital computer to compute prices for printout by weight or by count. It is also equipped to be tied in directly to a Universal Product Code random weight printer provided by Toledo as well as the conventional printer. (See figures 4 and 5.)

The General Atomic Company and Southwest Pump Company jointly presented a paper at the Northeast Weights and Measures Conference in Columbus, Ohio, in May of this year on their unattended gas pump system. This system utilizes several digital electronic techniques new to gasoline retailing and which open up new horizons.

The possibilities are unlimited. In the near future many different parameters or commodity characteristics may be randomly inserted by an operator into the dedicated computer built into a scale or measuring pump system and many results in addition to simple weight, volume, or price may be read out, printed out or used for process control purposes.

Now how does all of this concern weights and measures, whose main function is the protection of the buyer and the seller? First, let us go back to our discussion of the history of weighing with the emphasis on time. The even-arm balance has been with us

FIGURE 3

for 7,000 years; the steelyard scale for 2,200 years; the beam scale for 144 years; the pendulum dial scale for 74 years; and the electronic load cell scale for 24 years.

Toledo introduced its first digital electronic scale in 1965. Only eight years later, in 1973, the fourth generation electronic scales were introduced. They are much more complex and more accurate than those introduced in 1965. Another generation was introduced this year, and the next generation already lives. It is not just a laboratory dream. I am not speaking of routine product model changes, but rather of major steps in technology. The point, gentlemen, is that technology is moving rapidly. Things are happening quickly and the pace will continue to increase.

FIGURE 4

The effects of the move to metric as such will not directly affect these changes. But indirectly, the opportunity that metric will present will invite new people into the industry. Most will come from other high technology—mainly electronic, industries, both domestic and foreign. They will not be new capital intensive industries whose main strength is machining iron.

This all leads us first to Handbook 44—definitions, regulations, protection of the buyer and seller. For the most part, Handbook 44 is more than adequate for today's immediate needs with the usual revisions and additions discussed and effected at these Conferences. However, we are faced with a whole new technology

FIGURE 5

that is coming upon us rapidly as we just saw. In order to guide the manufacturers in their development with regard to compliance with weights and measures, and in order to guide weights and measures officials throughout the country in uniform interpretation and enforcement, it is essential that attention be given to new definitions and regulations that particularly recognize this new technology. It may also be desirable to group and classify them for easier use. Furthermore, regulations must be written in such a way as to promote and enhance the development of these new devices and not to restrain it. This is economically essential.

The question then is, How can this best be accomplished? We must look ahead and anticipate what is coming so that we can be prepared to move more quickly than has been the historical case in developing Handbook 44 regulations.

This, in my opinion, will require some very close cooperation between weights and measures and industry. Together, we must work out ways to accomplish this that are more effective and more efficient than they have been at least with regard to the time required.

The next question is one of jurisdiction. The most timely example is that of the checkstand scale and the electronic cash register and UPC system. With the stand-alone mechanical or

electronic checkstand scale, there is no question of jurisdiction. The question does arise, however, when the scale weight readout is in the cash register rather than in the scale or when the price information comes from the central computer rather than the scale chart. We must arrive at the right answer. It is essential from an economic viewpoint that the answer does not result in precluding the use of such systems. Some of the other future possibilities that I referred to earlier will lead to similar jurisdictional questions.

The next question involves information and training, particularly for weights and measures enforcement officials. Quite obviously, to be effective, weights and measures officials must not only understand their role and the regulations that they are enforcing, but must have a basic functional understanding, at least, of the devices and principles involved. I doubt that there are any experienced officials in the field today who do not fully understand the functions and principles of mechanical scales currently in use and probably most present electronic scales as well.

But how many officials fully understand a computerized in-motion box scale system with all its possible ramifications? I am not really sure, but I would guess that the number is not great.

You might say that there are not many occasions for weights and measures to become involved in a computerized in-motion box scale system. I grant you that is true today. However, my point is that the technological complexity of devices is coming upon us rapidly and will be in wide use in many applications.

I do not propose that weights and measures officials become computer or circuit experts at all in an engineering sense. They must, however, have a basic functional understanding of the equipment and principles in use. Many of you from weights and measures present here today have raised the point of information and training with us in our conversations here and in many of your state meetings.

Believe me, based upon our experience in the industry, this training is no small task. It must be undertaken, however. The questions then are, How can this best be done in the most efficient manner? How can industry cooperate with and assist weights and measures in this endeavor?

With the rapid growth of technology, with the opportunity that metric will present, with the push from consumerism, and in our own enlightened mutual best interest, I submit that it is essential that we begin together to address ourselves to these questions now. These are by no means all of the questions. I have

merely tried to point out the need and a few of the basic areas where the need is most critical. As pointed out by Dr. Ancker-Johnson and Dr. McCoubrey this morning, where a need exists, it will be filled by someone. We have ample examples around us today where needs were filled by people other than those most qualified. Is any further comment required?

I would highly recommend these topics for consideration by the appropriate committees of the National Conference on Weights and Measures. Toledo Scale stands ready to counsel with you. Without being presumptuous, I am sure that all others in the scale industry, and other industries involved with weights and measures, will be ready to cooperate as well.

Together we can anticipate our needs in this accelerating technological environment and hopefully derive the best possible answers to the many questions. Are you ready to accept the challenge?

METRIC CONVERSION

Role of the American National Metric Council

by Dr. Malcolm E. O'Hagan, Executive Director,
American National Metric Council, Washington, D.C.

The ANMC was established in 1973 under private sector initiative to provide a focus for planning and coordinating activities in organizations and industries converting to the metric system of measurement. We are a non-advocate organization, involving all segments of our society that are affected by the change. ANMC operates under the principle of voluntary consensus. The Metric Council does not duplicate the activities of existing groups. Instead, the Metric Council works through established consumer, labor, professional, technical, and trade organizations. When a national metric conversion board is created, ANMC will maintain close liaison and facilitate the work of the government metric conversion board by providing an established working interface with industry and commerce. By addressing the situation with a business prospective, the American National Metric Council will ensure that conversion to the metric system of weights and measures in the private sector is accomplished in an efficient and timely manner.

Adrian G. Weaver
Chairman of the Board
American National Metric Council

To provide assistance, through coordination, planning, and information services, to various segments of society in the United States which are involved with usage of, and/or conversion to, metric measurement, and specifically:

To help guide metric conversion in a manner that:

- Maximizes potential benefit and minimizes cost.
- Avoids duplication of work and effort.
- Advances the national economy and benefits the public health, safety, and welfare.
- Properly considers and evaluates the impact on various segments of society, particularly labor, smaller business, and consumers.
- Promotes consistent application of metric units.

From Article II
Articles of Organization
American National Metric Council

Compared with the worldwide flood tide of change to the metric system of weights and measures, the United States is drifting toward metric conversion. Each week another company announces its decision to convert to the metric system. These actions are independent of passage of national metric legislation. Many in the private sector have decided to take the initiative in determining how to cope with metric conversion. Their decision reflects the inevitable—the United States will one day be a predominantly metric country.

FORMATION OF ANMC

The American National Standards Institute (ANSI) recognized the need for coordinating metric conversion activities at an early stage and recommended that a coordinating mechanism be established within the private sector. This recommendation was strongly endorsed at a meeting of industry, business, and government leaders in September 1972. Subsequently, ANSI appointed a task force to develop specific recommendations and guidelines; and in December 1972 the ANSI Board of Directors approved the formation of the American National Metric Council (ANMC). Initial funding was provided by ANSI. Prominent indi-

viduals representing major industries, small business, organized labor, consumers, and education accepted the invitation to serve on the ANMC Board of Directors. The Board held its first meeting on May 7, 1973, and the Metric Council was underway.

Initial efforts were directed at defining the purposes and policies of ANMC, at structuring its scope and mode of operation, and at developing a basis of financial support for ANMC activities.

The Board quickly adopted the philosophy that the Metric Council must serve all interests and segments of society. Accordingly, in establishing subscription rates a low minimum and a low maximum rate were established. In this way all companies and businesses can share in supporting the work of the Metric Council and can benefit from its coordination and information services.

ANMC OPERATING POLICIES

Articles of Organization and By-Laws were approved by the Board at its meeting on January 30, 1974. Among the operating policies specified for ANMC in the Articles of Organization are the following:

- ANMC is an advisory and coordinating body, and shall operate under principles of voluntary consensus, encouraging active and objective participation of groups and organized segments of society.
- ANMC shall not become involved directly in the development of standards, but will assist existing standards-making bodies by identifying needs for standards in SI units, evaluating priorities, and making recommendations for such standards development.
- ANMC shall maintain the closest possible liaison and coordination with local, state, and Federal Government bodies, and with the National Metric Conversion Board when such a Board is established.
- ANMC shall be apolitical and shall not become involved in lobbying activities. This does not prohibit ANMC from submitting objective advice and recommendations as necessary.
- ANMC does not advocate metric conversion for any segment of society, but encourages coordination and planning on the part of those desiring to convert to metric usage.
- Because of the magnitude of the problem of metric conversion, ANMC will endeavor to work, primarily and to the extent possible, with established organizations and groups

representative of consumers, labor, professions, and business throughout the various segments of the economy.

ANMC BOARD

Members of the Board are elected for a three-year term with one third of the Board replaced each year. In this way, continuity is assured while new members join the Board. All subscribers to the Metric Council are entitled to vote on the election of Board members. The By-Laws provide that the Board consist of individuals "Whose viewpoints encompass the interests of all major segments of commerce and industry, including consumers, educators, labor, large and small businesses, and professions." Such board representation is reflected in the present Board and efforts are being made to apply this policy to all ANMC committees to the extent appropriate.

Three Board committees have been established: an Executive Committee, a Finance Committee, and a Nominating Committee. Four operations committees provide guidance for ANMC activities. These committees are Government Liaison, Metric Practice, Procedures, and Services.

Metric Practice Committee.—One of the key purposes of ANMC is to promote consistent application of metric units and metric practice. The Metric Practice Committee is entrusted with the responsibility of providing guidance in this area. Operating in conjunction with the Metric Practice Committee will be a Metric Advisory Panel. The panel will consist of 75 to 100 technical and trade associations, editors, and others who can provide informed advice. The panel will represent a suitable cross section of educated opinion, and it will be asked comment on issues of metric usage and metric practice where a clear consensus does not exist. Issues such as the spelling of the metre, the use of the pascal versus the bar, the use of the megagram versus the tonne, and the use of the comma as a decimal marker will be under consideration.

All polls of the Metric Advisory Panel will be preceded by a full explanation of the conflicting schools of thought, and each school will have an opportunity to present its case to its own satisfaction including rebuttal where appropriate. An early service of the Metric Council will be the publication of an editorial guide to provide guidance to authors, typists, editors, and publishers on proper metric usage.

Procedures Committee.—Of major concern in any industry-coordinated activity is the antitrust implications of such activity. Activities of the American National Metric Council are guided

by a Procedures Committee. This committee, consisting of lawyers, establishes guidelines for meeting agendas, recording and distribution of minutes, and representation at meetings. Any activity or subject matter with antitrust implications will be reviewed by the Procedures Committee prior to action.

ANMC COORDINATING AND SECTOR COMMITTEES

The primary function of ANMC is to coordinate metric activities in various segments of the economy. This is being managed through a series of committees. Five major coordinating committees have been established in the areas of materials, engineering industries, building and construction, consumer products, and education and industrial training. Operating under each coordinating committee is a series of sector committees (refer to table 1). In dividing the coordination task and establishing the committee breakdown, ANMC recognized that in most cases the immediate and direct impact of metric conversion will be on products. Accordingly, the committees were structured to address broad classes of products similarly impacted by metric conversion.

The Standard Industrial Classification was adhered to as closely as possible. Additional guidance was provided by the committee structures established in the United Kingdom, Canada, and Australia to coordinate metric conversion in those countries. ANMC has established a close working relationship with the Canadian Metric Commission at all levels, and their advance planning and experience are serving as a valuable guide.

The initial work of the sector committee will be of an investigatory nature. It will determine the status of metric activities within the sector it represents. The primary source of information will be the trade, technical, labor, and education associations and, in some instances, individual corporations. Associations not directly represented on the sector committee will be asked to present written inputs to the committee. In some cases, an industry-wide conference will be conducted by the sector committee to which all associations will be invited. The purpose of such conferences will be to provide status reports to the industry on the activities of the sector committee and to encourage their involvement as appropriate. It is expected that each association will have its own metric task force. It will be through these task forces that the associations interface with the sector committee. Among the initial activities of the sector committee will be the following:

- Determine the status of metric activities within the industry.
- Prepare a report for the industry on relevant activities underway in other industries or other parts of the economy.
- Initiate an analysis of the metric units to be used in the industry.
- Identify the federal, state, and local laws, codes, and regulations requiring amendment for the industry to go metric.
- Identify in general terms where soft conversion will be appropriate and where hard conversion represents an opportunity.
- Identify the elements of a minimum cost of conversion strategy for the industry.
- Identify the key factors controlling the industry's rate of conversion to the metric system.
- Identify the need for metric engineering standards required within the industry.
- Determine the nature of such standards, establish the priority in which they should be developed, and recommend a timetable for their development.
- Prepare a report summarizing the findings of the above. Distribute this report to the industry for information and comment.

INFORMATION DISSEMINATION

Fundamental to ANMC operation is the dissemination of useful metric information. The work, findings, and recommendations of the sector committees will be published in special reports. Summary accounts will appear in the "Metric Reporter," the official bi-weekly publication of the Metric Council. The "Metric Reporter" is also designed to provide timely information on all key metric developments. Its format is concise and to the point so that it can be used with ease as a reference document. The "Metric Reporter" is the spearhead of the dissemination program. It is supplemented by special publications and ANMC sponsored metric conferences. A resource center has been established at ANMC offices in Washington, D.C. at 1625 Massachusetts Avenue, N.W.; and anyone is welcome to use the center for research purposes.

ANMC ACCEPTS METRIC CHALLENGE

The task of coordinating a process as complicated as metric conversion on a national level presents a mighty challenge. It can only be achieved through the active cooperation of all segments of our society. Metric conversion is a business venture; it makes sense only if it offers some real advantages, only if it can be

turned to opportunity. A voluntary national movement is underway in the private sector through the American National Metric Council which is the only organization coordinating metric conversion on a national scale. We have the opportunity to chart our own course and manage our own destiny; the opportunity for each segment of society to undertake conversion in the manner and on a timetable best suited to its own particular needs. And in going metric, we must avoid the pitfalls of expediency and short term convenience. We must convert in a way that makes sense for the future and contributes to a sound, growing economy.

TABLE 1

ANMC Coordinating and Sector Committees

MATERIALS

- Primary Metals
- Chemicals and Allied Products
- Energy (Fuels)
- Wood and Lumber Products
- Paper
- Mined Products

ENGINEERING INDUSTRIES

- Aerospace
- Highway Vehicle
- Instruments and Related Products
- Off-road Vehicle
- Machinery (except electrical)
- Power Generation and Distribution
- Marine
- Rail
- Computer and Office Equipment
- Electronic Equipment and Components
- Electrical Goods

BUILDING AND CONSTRUCTION

- Codes and Standards
- Design
- Building Materials
- Construction
- Real Estate

CONSUMER PRODUCTS

Food and Grocery Products
Apparel and Household Furnishings
Commercial and Consumer Measurement Practices

EDUCATION AND INDUSTRIAL TRAINING

In-Service Training
Teacher Education
Educational Materials
Consumer Education
Administrator-Staff Training

METRIC CONVERSION

Consumers Call for a Rational Approach

by LOUISE A. YOUNG, Extension Specialist, Family and Consumer Economics, University of Wisconsin-Extension, Madison, Wisconsin

Consumer attitudes toward metrication have changed considerably over the past four years. When a positive approach to metric education is used and consumers really understand the need for the change, most of them are willing to accept that change; but they do want a rational, orderly, and consistent approach to conversion and an educational approach which is simple and clear.

They recognize that to be wedded to the present is to be widowed in the future in this situation. However, motivation for really understanding metric as it will apply to them and developing a positive attitude will be the keys for the adult consumer. Along with this must come efforts to alleviate the fear which many older consumers have for change—in this case, from the customary to the metric system. Perhaps this is true for others, too.

Educators, other professionals, business, and the media must take the lead and cooperate to assist in making people aware of the metric potential and educating people regarding it. Four years ago at the American Home Economics Association Conven-

tion (AHEA) I made an informal survey of a few exhibitors' reactions. These were primarily professionals and business people involved with foods, clothing, equipment, and home furnishings. When I asked what they were doing to prepare for a changeover to the metric system, I estimate 90 percent of the ones I talked with had given little or no consideration to this. However, I got various reactions.

Particularly concerned were home economists involved with recipe and cookbook development for their products. Many of them indicated a hope that they would not be faced with such involvement, but as an afterthought would say, It is a good idea. Other exhibitors said, The sooner the better. Finally there were those who said, I haven't even thought about it; in fact, I don't believe our company has.

The week before last I repeated my cursory survey of exhibitors at AHEA. What a change! Many companies have equipment available providing both customary and metric measurements; in other words, dually marked. Much literature—some excellent—was being distributed, and the educators were clamoring for it. Several were introducing materials which would be ready for fall classes.

And, as you all know, the study made in 1970 by the Survey Research Center at the University of Michigan reported that 33 percent of the consumers favored change, 34 percent thought conformity with other countries was desirable, 47 percent thought the decimal measuring system would make price comparisons easier, and 55 percent thought the metric measures would be easier for children to learn. The higher the educational level, the greater the receptivity.

Early in my involvement with metrication as I worked with both professionals and lay persons, I frequently got the question, Why don't other countries change to our system? This question is not so frequently raised now. When a map showing that the United States is the only industrialized nation not on, or committed to, metric is presented along with other reasons for going metric, people change attitudes rapidly. They ask the question, What will it involve? They say, Let's get on with the show.

Today, practically all consumers and professionals with whom I talk have changed attitude, especially after having been exposed to metrication. They want more information. They continue to say, and to greater extent, The sooner the better. They follow with such questions as: When is this change going to be made? Tell us more. How can we get tooled up for this change?

The rational approach for education for conversion will be different for different groups of consumers, particularly different

age groups. Although the metric system is being taught in schools, some states are moving toward teaching only the metric system in math in the next couple of years, and youth will be thinking metric, the adult consumer will require help with conversion. They will not immediately think in metric.

Let us look at some methods and effects of metric changeover on the adult consumer. We here all have a responsibility to assist with this to make it simple yet meaningful.

The foods area is one of the most critical. Families will be more frequently involved, and straight conversion is not the answer. When one studies and converses with business people, one recognizes complications in some segments. However, an orderly change to metric is not insurmountable if we all cooperate.

Dual labeling will be essential for an interim period. Its use is increasing and especially as we have more nutritional labeling. However, consumers are asking that the dual labeling also be placed on the front panel of cans and packages. More and more companies are doing this but it can be expanded. Rather than confusing people, I believe it will assist people in learning relationships, perhaps subconsciously. We need to help increase awareness among consumers of the availability of this dual labeling.

Although I recognize concerns of some business, hopefully the changeover to metric can provide another spark to reduce the number of sizes of packages and provide more uniformity, both of which will assist the consumer in price comparisons. (I am concerned when I see a three-quart milk container being proposed—not only for the size proliferation but also considering the cost factor when a changeover to litre units will undoubtedly be forthcoming.)

One critical decision affecting the home food preparation area as well as business is the determination of the standard unit of measure which will be used. Although some are suggesting we change to weighing dry ingredients as is done in many countries, my investigations indicate that the average consumer is not willing to change from volume to weight despite the fact that the latter is a more accurate method. Institutional food preparation is really the only area where such procedures have been used to any great extent in the United States. How accurate are inexpensive scales which many homemakers would buy, and how accurate could all scales be kept—what with many children in homes using it as a delightful toy?

As we know, the cup has been the basic unit of measure. Under the Z61 ANSI standards the present cup capacity is 237 millilitres, which is difficult for decimalization. A committee tentatively proposed the 250 ml cup which has the same relation to

the litre as the present cup has to a quart, a seemingly logical relation and one which falls within the 5 percent tolerance allowed in the Z61 standards.

Unfortunately, many have accepted this new metricup as the standard—perhaps too quickly. Despite the fact that there is less than one tablespoon difference, that difference appears critical in some sensitive recipes and has created concern among some food and equipment companies.

Decisions regarding the unit of measure should be made soon. A small group is meeting tomorrow to consider making plans for reaching this decision. Already there are on the market two 250 ml measuring cups (metricups) dually marked. If we do change to this unit of measure, consumers can continue using present day measuring equipment with their favorite recipes. However, there is indication from research done that straight conversion of recipes to metric will not be made but new recipes will be developed to utilize new standards of measure when determined. This includes measuring spoons also. Incidentally, some wish a new name for the measure too.

Baking pans and cooking utensils will probably not need to be altered. The rounding off of metric measurements as done in the Z61 standards indicates sufficient accuracy.

Fresh produce and meat, when sold by kilogram, should create no problems other than learning the relationship to the present day pound. Packaging of butter and margarine may present a problem for consumers if we move to a 500 gram unit instead of the 454 gram pound, a change which seems logical metrically.

Changing range and recipe temperatures to the Celsius scale will require education, but this can be simple. Conversion tables can be developed to be attached to the range or cookbook. Again, the rounding off of Celsius temperatures with new recipes should prove no problem.

Metrication in the clothing area can have important ramifications—not so much in decisions as to units of measure of fabrics and related items as in sizing. Interestingly, it is in this area that many companies are offering new metric equipment. Now many sewing accessory items are dually labeled. The metric tape measure is much more readily available as are meter sticks and sewing gauges. One company is dually marking precut lengths of sewing aids.

Perhaps there are some, but I have not found fabric widths marked in centimetres in this country although pattern material requirements do give this information. Several pattern manufacturers have been dually marking seam allowances for some time,

primarily because of international trade. They also indicate body measurements in centimetres, either on the pattern jacket or on construction sheets and in their construction books.

A psychological problem arises among some women regarding the body measurements in centimetres! However, this is not so with weight, which, of course, is less in kilograms. I have not found men so much concerned.

Again, going 'metric can provide an opportunity for greater standardization of clothes sizing which many consumers would like. Development of international standard sizes will be helpful for both trade and travel.

Going metric will greatly simplify, for the consumer as well as businessman, the calculation of the amount of carpeting and material needed for draperies and curtains in home furnishings. How much simpler will be calculation in metres than the yards, feet, and inches combination we currently use .

Using the Celsius scale instead of Fahrenheit for indicating climatic conditions and health determination introduces consumer concerns similar to the baking temperatures. However, new thermometers will soon appear. Some radio and TV stations are giving weather in both Fahrenheit and Celsius, but I understand surveys have found some people are paying no attention to Celsius temperature reports. We must assist in this educational program helping people recognize relationships. How many of us can readily use the formula for conversion of temperatures?: $C = 5/9(F - 32)$.

Metric sizing for equipment and furniture other than built-ins will not be a problem; however, availability of repair items will probably create confusion for both the business person and the consumer for a period, since items in both customary and metric must be available. We have not mentioned many other consumer concerns—gasoline, speed limits, etc.—but time does not permit.

Now I would like to discuss ways to assist consumers in moving to metric using a reasonable and positive approach and carried out by business, educators, other professionals, and the media.

- Decisions regarding standards critical for consumers should be speedily made by official leaders to prevent the appearance of contradictory information and confusion for consumers. This appears to be moving forward quite rapidly now.
- Educators must be motivated and given assistance through accurate information and suggested methods for teaching at all levels. They must be given criteria by which to judge

materials. Different approaches must be recognized for use in the elementary and secondary schools and among various ages and groups of adults.

- Many more adult consumers must be helped to understand the need for, and methods of, conversion in areas affecting them. Correct information must be made available. Any changes in increases in unit package quantities, such as a litre of milk or a 500 gram unit of butter or margarine, with accompanying price increases must be explained and be fair. Otherwise the consumer's concern that prices are being increased unfairly will be exaggerated still more.

Despite the fact that all SI units should be taught in formal classes, older consumers have different problems. Basic information they need and which will serve their purposes must be developed, identified, and presented to gain acceptance by consumers. I refer to material such as materials prepared by the Metric Information Office of the National Bureau of Standards—the fact sheet "All You Will Need to Know About the Metric (for Your Everyday Life)" and the booklet "What About Metric?" Recognition that rounding off can be done in many cases and not affect the consumer product will make metric conversion more acceptable to consumers.

Finally, how do we meet these and other problems?

- Can we all work to have consumers promote the passage of the metric legislation which would provide a body to give leadership to an orderly changeover and give a time period for the changeover?
- Can we—educators, weights and measures personnel, business representatives, and other involved professionals—get together on a state basis, perhaps organize committees which can help coordinate state efforts to avoid duplication of efforts; identify educational gaps; identify, develop, or make suggestions for educational materials for effective teaching at all levels; and make certain we are going in the right direction?
- Can state and local weights and measures personnel and educators cooperate more closely in local educational efforts at all levels? Is more consumer involvement needed in your work? If so, how do you see that we who are involved in the consumer movement can assist in increasing that involvement in concerns you specifically have or with metrication in general? Would consumer representation on your national committee be helpful, particularly your Committee

on Education, Administration, and Consumer Affairs and Committee on Metric Planning?

- What are the implications for your state food and packaging laws if we move toward a metric country? Can consumers or other professionals be of assistance in these areas?

In conclusion, we need to recognize that what we are ten years hence depends upon what we do today and tomorrow.

METRIC CONVERSION

Conversion in Australia

by JAMES A. SERVIN, Warden of Standards,
Standards, Weights and Measures Branch, Thebarton,
South Australia

It gives me great pleasure to be here today. When I was asked to address the 58th National Conference in Minneapolis last year, I never thought that I would be fortunate enough to be attending the 59th National Conference this year or that I would be asked to address you once again.

My subject is conversion in Australia; and I propose to deal with this subject mainly looking at the implications for a weights and measures organization. I would be remiss in my task if I did not give you at least a thumbnail sketch of the complete conversion in Australia.

In January 1970, the then Australian Prime Minister announced that Australia was to convert to the International System (SI) of measurement over the following decade. In April 1970, a meeting was held between the Commonwealth and State Ministers to seek active cooperation by the states in the exercise. This support was given. The Australian Parliament then passed the Metric Conversion Act, which, among other things, says that Australia shall convert to the sole use of the International System of Units.

Of the 113 conversion programs which have been worked out, 36 have already been completed; and 65 had been commenced before January 1, 1974. A further 10 either have commenced or are to commence this year, and the remaining three will commence next year. Now this does not mean that Australia has

converted. What it does mean is that we are past the point of no return. All this has been achieved in a little over four years. The following is the method Australia used to achieve this.

First, a Board was established of some 13 members. Under that Board 11 advisory committees were established. The function of an advisory committee is to advise the Board concerning metric conversion in a particular area of activity, e.g., Education and Industrial Training is one advisory committee; Engineering is another advisory committee; Primary Industry is another advisory committee, and so on. The Board, in essence, split up the whole spectrum of Australian involvement into 11 categories—each advisory committee being responsible for a category. Each advisory committee then established a number of sector committees, responsible to it, to cover all the different facets of industry within the parameters of its responsibility.

If we take education as an example, the Education and Industrial Training Advisory Committee established seven sector committees:

1. Primary Education
2. Secondary Education
3. Technical Education
4. Industrial Training
5. Tertiary-University Education
6. Tertiary-Non-University Education
7. Adult Education

The sector committees were made up of men who were experts in their particular field. The committee's functions were to draw up the conversion program for that particular sector and to establish all that had to be done for conversion to be complete in that particular sector. When a sector committee had drawn up its program, it was submitted to the advisory committee. The advisory committee, first of all, ensured that it was compatible with the other programs from the other sector committees and, if supported, it was recommended to the Board. The Board then checked to see that the program was in line with the other programs over the whole spectrum and that it was possible for attainment before they publicized the draft program for comment around the industry concerned.

After the comments had been received, the program was subsequently accepted, approved, and returned to the sector committee for implementation.

One of the most important sector committees in the Board's establishment is the Units Sector Committee. Its prime function

is to see that the system being introduced into Australia is as pure as is practicable and to see that only one unit is used for each physical quantity.

For example, we found fairly early that if the various sector committees were allowed to have the final say concerning the units they would use, it would not be long before we would have one section of industry using the bar as the unit of pressure, another the pascal, and another the kilogram force.

While in the International System there is only one, the pascal, you can, if you are so inclined, argue a reasonable case for any of the others on either economic or world usage grounds. One of the main functions of the Units Sector Committee was to see that this did not happen. Indeed, in the example I have just quoted, the pascal was used as the unit of pressure throughout Australia.

Another important function of this committee is to see that the correct abbreviations or symbols are used. At the moment these symbols are internationally uniform. Yesterday, you had some discussion on them. I must stress that it is vital that America accept the internationally uniform abbreviations or symbols irrespective of how much pressure you get from industry. If the one thing both the Arabs and the Israelies can agree on is these symbols, if the one thing both the Protestants and Catholics of Northern Ireland can agree on is these symbols, surely America can also agree on them and make them truly international.

It matters not whether you spell metre correctly with an "re" or "er"; what matters is that when abbreviated it is a lower case "m," so that when it is written here, whether it is read in Ethiopia, Western Samoa, or Chile by a person who can read English or can hardly read at all, it is understood. That is what is important.

I have digressed from my main point, but this is so important.

This is a rather sketchy outline of how Australia has converted in the stage to which we have arrived in mid-1974. I have done it in this manner because half an hour is not long for an address on metrication; and I wish to devote most of my time to looking at metric conversion as it affects weights and measures organizations. I have done this because this will be of prime importance to most of the people present here today, and because, to a certain extent, it is the cornerstone of any conversion program.

I have outlined eight points concerning weights and measures administration and metric conversion, and I propose to spend a few minutes on each point.

The first point is the need to convert your own thinking from customary units to SI units; and I deliberately said SI units, not metric units.

I believe the intention here is to go to the predominant use of SI units. The Intrenational System is a far superior system of units than any of the older metric systems. It is a completely coherent, logical, and rational system of units. There is one, and only one, SI unit for each physical quantity. While any country in the throes of conversion needs to include some non-SI units in its new system, at least in the transitional stage, one is wise to keep these to the absolute minimum or you will find that you have lost quite a lot of the advantage of conversion.

When a country changes its system of weights and measures it is presented with an opportunity that it may never get again to rethink what it has done in the past, and why. I say that in all seriousness. How often does a country change its weights and measures system? In the case of Australia, this is the first time that we have ever changed it. In the case of England, it is the first time in over a thousand years that they have changed their system; and in the case of the United States, it is the first time since the Pilgrim Fathers set foot on American soil that you have changed or that you have contemplated changing your system of weights and measures.

It follows, therefore, that the first thing which one has to do is to rethink just what are the basic aims one has been trying to achieve in the customary system and then to try to establish the best way of achieving those aims in the new system. Now to do this, one has to think in the new system. If I can give you an example from industry: When we first started to convert, most of the businessmen who rang me up would say, "We are packing such-and-such in 1 pound or 2 pound packs now, and we wish to convert these to the metric system. We believe the right thing to do is to convert to 450 gram and 900 gram packs because this will mean the least modification to our pack design, to our filling machines, to our cartons, and because they will be far easier to price."

And I would say, "Easier to price? How will you be pricing when you have changed to the metric system?"

They would hesitate for a minute and then they would say, "Oh, so much per kilogram."

And I would say, "Well, would it not be simpler to work the costing of your packaging plan out if the units were 500 grams rather than 450 grams, or 1 kilogram rather than 900 grams?"

Again, there would be a moment of silence. They would suddenly realize that, of course, it would be. They had been looking at the problem from the point of view of the customary system where they were used to pricing in pounds and multiples of pounds; and they thought they would still be doing this in the

new system. The same sort of thing is basic in our own sphere of activities, e.g., in weighing instruments the graduation values are in relation to the pound and multiples of the pound; in a metric environment they must be in relation to the kilogram and multiples of the kilogram, not 450 gram values or 900 gram values.

Conversion to the International System or metric system is not difficult, provided you have oriented your thinking to the new system. It is most difficult if you try to plan your conversion process while you are still thinking in your own mind in terms of the customary units. I can think of no better example for this than the technical requirements which you have for instruments as laid down in your Handbook 44. When I was preparing this paper, I read through your Handbook 44 and noted at least 193 references that required conversion to the International System. In most of these places a direct conversion or a soft conversion did not seem to me to be in anyone's best interest.

The second point in the conversion of a weights and measures organization is the need for an in-depth study of your own organization to see what needs to be done to convert it, so that it will be predominantly metric early. It must, of course, be remembered that complete conversion of a weights and measures authority cannot take place until the whole country is converted.

A weights and measures organization has a unique role in conversion in that it must be the first organization in the country to have a capability to work in the new system; and it must be the last organization in the country to relinquish its capacity to work in the old system. This, in itself, creates many problems.

What we did was to make an in-depth study of our whole operation to see what was needed to give us a capacity to work in the old system. This, in itself, creates many problems.

What we did was to make an in-depth study of our whole operation to see what was needed to give us a capacity to work in the metric system early; to see what facets of our organization could be converted to sole metric operation early; to see what facets of our organization would need to remain in the customary system, at least for the initial period; and, finally, to see what facets of our organization need to remain in the customary system until the end of the conversion program.

The first thing was to provide sufficient numbers of inspectors with working standards in the metric system to allow any instrument to be tested in that system. Coupled with this was the need for early training of the organization, but I will deal with that one a little later. Then we found all of our own internal reporting

could be metric; and if it was metric, we would make it simpler and easier on the inspectorate and the office staff.

Very early in the conversion program we were prosecuting people for delivering short weight in the customary system and advising the court of the shortages expressed in grams or millilitres as the case may be. This had a side advantage; it helped to teach the courts an appreciation of the metric system.

We found we were able to convert the large test weights on our vehicle scale test truck from a half ton to a half tonne very early. It was a comparatively simple matter for the inspector to use those weights to test a weighbridge irrespective of whether the weighbridge was calibrated in terms of either the metric system or the customary system. We had a need to buy additional inspectors beam scales for testing weights and packaged goods. We commenced a program of buying Mettler top-pan constant load balances which were calibrated in terms of the metric system. The inspectors had no problem in setting weights in the customary system on the Mettler balance or in checking packaged goods for accuracy against the quantity statement. Indeed, in the latter case it was found to be far easier to work out the percentages in the metric system than in the customary system.

We have gone about as far as we can go in our own branch's conversion until Australia's conversion program is completed. Each inspector has a set of metric standards of mass and a set of imperial or customary standards of mass; a yard measure of length and a metre measure of length; a balance, which is a metric constant load balance; and we have sufficient measures of volume to give each inspector a complete set.

Now it is a matter of waiting for the particular facet to completely convert when we will be able to start to withdraw the customary standards from the inspectorate. But because our program is a voluntary one, the same as yours will probably be, it is anticipated that it will be the end of 1980 before we will be able to completely withdraw the customary standards from the inspectorate and withdraw the references to the customary units from our Act and regulations. Until that day, the Branch cannot completely convert.

The third point is the need to ensure early in the program that there is no legal impediment to conversion or use of metric units or instruments. This is a comparatively simple matter of going through your Act and your regulations and ensuring they make provision for the lawful use of the metric units or metric instrument in all, and I stress the all, situations.

One of the catches to be aware of in this particular exercise is a comparatively minor regulation or section of an act, or indeed

definition, which is restrictive on the use of the metric system, sometimes in a very oblique way. There is no short cut available here. It is simply a matter of sitting down with your legislation and seeing what amendments are necessary to couch it in metric terms. I stress that, however, to couch it in metric terms.

Again, early in the program we in South Australia had the opportunity to amend our Act and regulations to couch the Act in metric terms; and we framed our regulations so that the only time that customary units are mentioned is in the tables of tolerances permitted on instruments. Any regulation which requires that an instrument shall be situated so far from a building or some other obstruction or that the length of a hose on a driveway flowmeter shall be no longer than so much, or the approaches of a weighbridge will be concreted for so much, all these were redrafted to specify those distances in rounded metric quantities. This, of course, means that you have to put amending legislation through your legislature; and one can never guarantee to control the speed of output from those august institutions.

This automatically leads to the fourth point which is one that I have mentioned previously and that is the need to examine your own pattern approval, as we would call it, or type approval requirements, as you would call it, or type approval requirements, as you would call it (your Handbook 44), to ensure that provision is made for:

1. metric requirements for new metric patterns or types
2. existing customary system patterns or types to be manufactured in metric
3. conversion of existing instruments to metric.

Now they might all sound like the same thing, but they are three totally distinct things. They may be related, but they are totally distinct from one another. In the case of the first one, you need to ensure that there is provision for a manufacturer to design a new instrument purely and solely in terms of the metric system. You may well be saying to yourselves, "We have a section in our Handbook 44 which already permits this to be done."

It is paragraph G–A.4. of the General Code, but from any reading of it that paragraph could lull you into a false sense of security. I do not claim to be an expert in your Handbook 44, but from my reading it I believe a manufacturer would have difficulty in trying to design a metrically designed instrument calibrated in terms of the metric system in line with your existing Handbook 44, because of its heavy orientation towards thinking in the customary system.

To enlarge on what I mean, paragraphs S.1.1.2., 1.1.3., 1.1.5., and 4.2. of the LPG Vapor Measuring Devices Code are the best examples of what needs to be done. In these paragraphs the requirements are specified in both systems, not as direct conversions one of the other, but each in its own right as they ought to be. A quick comparison between these paragraphs in this section and the same paragraphs in any other section will show you what I mean. Paragraphs 1.2. and 1.3. of the Scale Code is a fair example of the category of references which have to be altered. In paragraph 1.2.3. you are talking about the clear interval between graduations and you say that it shall be not less than 0.02 inch. That is 0.5080 millimetres. Surely if you are going to allow 0.02 inch intervals in customary scales, you would allow 0.5 millimetre intervals in metric ones.

I might add that in Australia we require a larger interval between graduations. We used to require an apparent interval of 1/16 inch; we converted this to 1.5 millimetres.

In paragraph 1.5. you talk of money values and you talk of cents per pound. Now you must decide whether or not you are going to double this for cents per kilogram. Two cents per pound is near enough to 4 cents per kilogram. But the whole problem is that 4 cent graduations are an inconvenience. Five cent graduations are a lot more practical.

In table 1 you specify minimum travel instruments of varying capacity. Again, the question is whether 2 pounds is to be considered equal to 1 kilogram for all practical purposes. We took the view that for instrument conversion purposes 2 pounds equal 1 kilogram. This is an increase of a little over 10 percent, but the scales are quite capable of the resultant increase in capacity.

In most cases the resistance mechanism was found to have sufficient range to cater for this. If a scale had a capacity of 2 pounds, it could be converted to 1 kilogram or 10 pounds to 5 kilograms. Similarly, we required scales graduated in ¼, ½, or 1 ounce graduations to be converted to 5, 10, or 20 gram graduations. This was a tightening up, but was the only practical solution because in the metric system the logical graduation values are the 1.2.5 principal as opposed to 1.2.4.8 principal of the customary system.

The second category is provision for existing customary system patterns to be manufactured in metric. Now this is different from the first one. In the first one, you have the case of a hard conversion, a metrically designed instrument; in the second one, it is soft conversion. You have the case of the existing instrument or instruments of an existing pattern or type which a manufac-

turer wishes to continue to make in the new system. These will, in essence, be customarily designed instruments that are converted before sale, or in the course of manufacture, to the metric system.

In the third category is provision for conversion of existing instruments to metric and here you will say to me, "Ha, I have got you because these are the same as number two." They may be, they may not be; but they all have one subtle difference and that is: These are instruments that have previously been made and have been stamped and used for maybe twenty years in the customary system. They are now going to be converted to the metric system by their owner who was not the manufacturer. It may even be that the type is no longer made today. It does not automatically follow that the requirements which you could allow these instruments are identical with the requirements that you would allow the second category of instruments. Indeed, one would normally expect that you would be harsher on the second category of instruments than you would be on this third category in an environment of no compensation.

In both the second and the third categories it will, in all probability, be necessary for you to allow these instruments to be converted or made without fully complying with the metric requirements of your handbook. This is what we have found in Australia anyway.

One of the major problems we found there was that the decision was made and announced that Australia was to go metric. Even though there was approximately an 18-month planning period in which very little conversion work was being done, people immediately wanted our instrument specifications in metric because they wanted time to design new instruments.

So speaking for a moment on a national basis, I would commend to you the fact that one of your prime tasks is to have your Committeee on Specifications and Tolerances convert the requirements of your Handbook 44. Here we found that, in essence, we have two sets of specifications; those for customary instruments and those for the newer metric types of instruments. We have also found that, speaking generally, the specifications for the metric instruments are far more rational and coherent than the specifications for the customary instruments ever were.

This again leads to the fifth point, the need to produce your regulations or ordinances stating both customary system and metric system requirements. It is impossible for them to be the same. This, of course, is a real heaven-sent opportunity to rationalize and rethink what your requirements are. However, if you

are going to avoid being accused of tightening up your requirements at the time of conversion, you have got to be careful.

We in Australia were faced with the problem that both the Federal Government and each state government declared that it would endeavor to see that the burden which was placed on the public after conversion of regulations would not be greater than the burden on the public before the regulations were converted. This is a very good principal which at least keeps the administrator honest; but it creates headaches at times because it is not always a cut-and-dried matter as to which is the correct way to go to ensure that the burden placed on the public is not greater after conversion than before.

I will give you an example of one which is not in the weights and measures area at all but which I came across in my role of being the officer responsible in the South Australia Government for coordinating the whole Government's conversion exercise. We have in South Australia a local government ordinance which requires that the height of a fence at an intersection shall not be greater than three feet; and this had to be converted to the metric system. The question arose as to whether it should be converted to 1 metre, 0.91 metre, or 0.9 metre. To make it 1 metre, you are being more lenient on the property owner but harder on the motorist driving down the street who is trying to see what is coming around the corner as he approaches it. Alternatively, if you make it 0.9 metre, which is slightly less than the yard, you are being easier on the motorist but harsher on the person who owns the property. That is one of the best examples of the administrator being wrong no matter which way he goes.

I will give another example also of why the regulations will be different in both systems; and, again going outside the weights and measures area, I will give you the example of the requirement which used to be in the South Australia law which made it an offense to consume alcohol within three hundred yards of a dance hall. Now, if you do a direct conversion, that ordinance would be changed to make it an offense to consume alcohol within 274.32 metres of a dance hall. The two things which are ridiculous about that are the actual statement itself and the implied degree of accuracy.

In the first statement it is within three hundred yards of a dance hall, and the implied accuracy could be as liberal as fifty yards or as tight as one yard, depending on how you interpret it. But in the second case, and we are talking about the same distance of 274.32 metres, the implied accuracy is between 274.33 metres and 274.31 metres, a distance of two centimetres or roughly three quarters of an inch.

This is a major hazard for people whose responsibility is the conversion of legislation. The tendency is to take the distance that is quoted in existing legislation and convert it directly to the new system without taking into consideration the degree of accuracy intended, inferred, or implied in the original statement. One should remember that it is possible to work out some of the conversion factors to 32 decimal places and while they may be mathematically correct, from the point of metrology they are ridiculous.

My sixth point is the need to ensure that the testing and enforcement staff has adequate metric equipment early. I mentioned this in my second point dealing with the need for an in-depth study in the organization. This point is vital and, indeed, as a corollary to it, there is the fact that we have found it wise to set a date after which distinct preference was given in purchasing solely metric equipment, second preference to dual metric equipment and customary equipment, and, only as a last resort, purchasing purely customary equipment. We have now reached the point where we would not buy purely customary equipment.

The major point to bear in mind here is the life span of the equipment that you are purchasing in relation to the length of the conversion exercise. If the equipment has a life span which is less than the conversion exercise, then it does not matter which system you buy it in. But if the equipment has a life span which exceeds the conversion exercise, then there is a distinct advantage in buying it in terms of the new system. This will largely depend on Government policy.

In my case the South Australia Government decreed early in the exercise that due preference should be given to metric if the life span of the equipment was anticipated as greater than the length of the conversion program.

This has had many advantages for us. Probably the best example would be that in Australia all road speed and distance signs are being converted in the month of July of this year; but from February 1972, all new vehicles purchased by the S.A. Government have been fitted with a metric speedometer and a metric odometer with a m.p.h. decal on the inside of the speedometer. This has meant that at the time that the speeds legally change, all the vehicles driven by S.A. public servants have a metric speedometer at no cost to the Government. The whole fleet has been changed at least once in that period.

The seventh point is the need to train your staff so that they are proficient in the metric system and so they can and do think in it. This needs to be done early. The public will look on the

weights and measures inspector as an expert; and if he is unsure of the system, they will think it more difficult than it is. That aside, as a straight public relations exercise, it is essential for the weights and measures staff to be proficient in the metric system as early as possible in the conversion program.

The eighth point is the need to ensure that weights and measures enforcement authorities through one or more representatives have a very real voice in the overall planning of metric conversion in the country and are consulted beforehand on projected industry conversion dates. This is of prime importance because of our involvement at all levels of industry and commerce. Consultation on projected industry conversion dates is essential because one of the major bottlenecks in conversion is the lack of trained technicians to convert instruments and the need for those instruments to be recertified by an inspector of weights and measures after they have been converted.

In conclusion, I would like to draw your attention to a couple of points. Firstly, Australia is converting to the use of the International System of Units as the sole system of measurement and, as I understand it, the United States is converting to the use of SI as a predominant means of measurement. There is a vast gulf between these two. It is far easier to get a country to convert to a system as the sole system than to get a country to convert to it as the predominant system. How do you convince business people that they are not included in that section which can remain in the old system?

Secondly, I have just recently come from a Pacific Nations Metric Conversion Conference at Lae in New Guinea where some 22 countries of the South Pacific area met to consider the problems associated with metric conversion. One of the main problems that stemmed out of this conference was the fact that we can only go so far in our conversion exercise before America converts or at least before America announces her intention to convert and starts to plan towards that end. Even in Australia's case, we cannot completely convert our meat industry because those people who pack for export to the United States must mark their export meat packs 25 pounds net and are forbidden to put a metric statement on it even as an additional statement.

There is also the question of timber sizes which cannot be satisfactorily resolved until the world's biggest producer, the USA, enters the discussions.

Thirdly, I have not even mentioned conversion of packaged goods. That is a completely different ball game and would take a half hour just to scratch the surface.

Finally, I hope that this dissertation has been of some benefit. I can assure you that the rest of the world is eagerly awaiting America getting its feet wet in metric conversion. I can also assure you that the problems which you have to face in the period ahead of you in metric conversion will not be as great when you are face to face with them as they now appear.

DISCUSSION

MR. W. A. SCHEURER (H. J. Fuller & Company): What is the legal unit of weight for postage in Australia now?

MR. J. A. SERVIN (Australia): Grams.

MR. SCHEURER: One letter?

MR. SERVIN: Ten grams replaced the half-ounce weight; twenty grams replaced the one-ounce weight limit. We have gone to the international system.

MR. SCHEURER: An ounce there is twenty grams?

MR. SERVIN: Twenty grams, yes; and for air mail it has gone to ten grams instead of half an ounce.

MS. JOANNA LINDQUIST (Virgin Islands): I would like to direct my question to either Dr. O'Hagan or Miss Young. Would metrication eliminate the need for unit pricing?

DR. M. E. O'HAGAN (American National Metric Council): The isssue, looking at this from a consumer viewpoint, as opposed to standard packaging seems to be a very important one. There seems to be a general preference not only here but abroad as well. I mentioned that with respect to the EEC there is a definite preference for standard packaging as an alternate to unit pricing where that can be applied.

Personally, I feel that in areas where there are requirements for unit pricing now those requirements will not necessarily be eliminated in a change to metric. Even in a simplistic case of something that costs 59 cents for 500 grams, some people may find it difficult to calculate in their head what the price would be in kilograms—even though it is only twice fifty-nine.

In general, I think there seems to be a preference against unit pricing because there are many business problems associated with it. The emphasis is on standard packs. If the standard packs can be carried far enough, it should take care, I think, of the consumer's requirement for easing comparative shopping.

MISS LOUISE YOUNG (University of Wisconsin): I think I would agree. I would say that it would not do away with the need for unit pricing for some of the reasons that Dr. O'Hagan mentioned. It will make it much easier if we do not have unit pricing—

and certainly we do not have it in all stores—but I still think it can be helpful to people to have unit pricing regardless. Do you have any comments, Mr. Servin, on this?

MR. SERVIN: I would agree that if there exists a need for unit pricing now, there still would exist that need for unit pricing in the new system.

MR. S. J. DARSEY (Florida): In all the discussions I have heard on converting to metric, the primary interest has been to convert on even metric units; five hundred grams, for instance. Now there are multitudes of products in this country that are 16¾ ounces. How are we going to convert to metric without an accompanying method of sale regulation that is going to say they have to be converted to even metric figures?

MR. SERVIN: My answer would be that you cannot. I have been amazed at the proliferation of package sizes that I have seen in the United States. In Australia we do have standardization of certain commodities—packaged goods. As far as I am aware, you are about the only country of any major importance that does not have items of goods standardized; that is counting the EEC coming into it right now.

If you hope to convert to the metric system and at the same time arrive at voluntary standardization of packaged goods, then my comment would be that you would have as much chance of success in that as you had in the past in voluntary standardization of packaged goods in the avoirdupois system—which is nil.

MR. DARSEY: In Australia you do not have packages 451.6 grams and 1.23 kilograms? You have even figures all the way?

MR. SERVIN: We try. We have packaged goods in Australia generally fall into three categories: either those commodities which are required by law to be sold in standard sizes; those commodities which are not; and the third category would be those commodities which are straight random weights and sold under unit pricing; namely, cuts of meat and things like that.

In the conversion exercise we gave the packaging industry a list of sizes that we considered would be ideal. We said to them, "If you do not wish to, at some stage, have to justify why you should not sell your packs in standard sizes, then we suggest you pack them in these sizes. If you are prepared to take the risk, pack them in whatever sizes you like, but be prepared to justify that the size you have chosen is in the public's interest." Those are the only grounds that we would listen to.

MR. DARSEY: In other words, you have standard legs of lamb, right?

MR. SERVIN: As I said before, they would be required to be marked with the weight, the unit price, and the price of the piece.

MR. DARSEY: Well, I think the random weight packaging would definitely indicate then that unit pricing would be absolutely necessary.

MR. W. N. SHANNON (Berkel Incorporated): I have several questions for Jim Servin. I am interested in the population of Australia, which is, as I understand it, approximately two million. I am interested in the number of qualified scale technicians, the estimated time to convert both retail scales and industrial scales, and in a recent issue of "The Metric Reporter" of the American National Metric Council which described another commonwealth country, New Zealand, in saying that the retail sector was considering opposition as far as conversion of its weighing devices, but it was overcoming it even though it was letting the costs fall where they may.

MR. SERVIN: We have slightly more than two million people; it was thirteen million at the last count. I would not have a clue as to the actual number of qualified scale mechanics. It would be only hazarding a guess at around 250 or 300. The industry has estimated, and there are no real figures to prove this other than the industry itself, that it will take approximately four hours to convert an instrument, either retail or industrial, to metric. That is an average. Some, of course, will take less because some only need minor modifications; others will take a lot longer.

In answer to your question concerning New Zealand, we also have that same problem. In fact, I would think that New Zealand is probably a little further advanced in the area of conversion at the retail shop level than Australia. The problem here boils down not so much to conversion as to opposition to being the first cab off the rack. No one wants to be the first shop to convert because of fear of losing trade; and no one wants to be the last shop to convert because of fear of losing trade.

We are trying a pilot exercise in Sydney at the moment. Here, in effect, a whole area is being done on a geographical basis. The whole area has been interviewed, and they are trying to convert in six weeks.

MR. SHANNON: Was there an estimate of the time period for the country to convert scales?

MR. SERVIN: We had a couple of estimates of this, one of which proved so wrong very early in the piece that we disregarded the second one as well—I mean that in all seriousness. You have a problem here, you know. The people who are giving you this information are from the scale fraternity. In all due respect (I have some very good friends in the scale fraternity), they are either in the business to sell scales or to repair them and their figures are sometimes exaggerated a little bit. It seems to us that the

retail sector will take about three years to convert. About 60 percent of the wholesale sector has been converted in eighteen months.

MR. L. O. LEENERTS (Purex Corporation): This is also for Mr. Servin. What is the status of products being imported into Australia? Will they have to be in the regular units that you require for your own manufacturers, I mean the same sizes?

MR. SERVIN: You mean prepackaged goods?

MR. LEENERTS: Yes, prepackaged goods in the exact same sizes that you recommend?

MR. SERVIN: The situation in Australia regarding prepackaged goods at the moment is that they can be marked either in metric or in Imperial—the option is yours—up until the first of January 1976. We have not, and will never, legislate for dual marking. From the first of January 1976 on, every package must have a metric mark on it whether or not there is a customary mark on it. If the goods that you are exporting to Australia are goods that would be required in Australia to be sold in standard sizes—such as sugar, tea, flour, these sorts of things—then they would not be allowed into the country for sale unless they were packed in those sizes. This is the same in any other country. If you are exporting to a country, you must pack the goods so that they comply with the law of that country.

MR. K. SIMILA (Oregon): One of the problems with the customary system, of course, is the confusion between mass and weight. In the SI, or metric system, you have kilograms, mass, and Newton's force. Do you refer, Mr. Servin, in Australia to your packaged quantities that normally would be referred to in terms of weight units as mass or net mass. Do you not use weight in reference to those?

MR. SERVIN: Australia has been accused of being the second purest country on Earth as far as metric conversion is concerned, South Africa, being the purest, is where they talk of a weighing instrument as being a massometer. We have not gone that far. We, through the medium of education, are teaching children that the correct term to use is mass and not weight.

We recognize that this will take probably twenty-five years to get general acceptance. As an interim measure we are endeavoring to change our legislation to make it clear that for all legal purposes mass and weight are the same thing and that when a person says weight he means mass. We are putting the emphasis that way (weight means mass) rather than the other way (mass means weight) unless he is talking about a gravitational force, and this has a spinoff which we, at the moment, are going through in my own state.

What do you call your Weights and Measures Act? Not Mass and Measures. What do you call your department? We are looking at this at the moment. South Africa has changed its departmental name to Trade Metrology.

MR. D. OFFNER (St. Louis, Missouri): I am curious as to what size containers are allowed for the sale of milk in Australia.

MR. SERVIN: A quarter pint, a third pint, a half pint, a quart, a half gallon, and a gallon in the Imperial gallon system, not your gallon. In the metric system 200 millilitres, 300 millilitres, 500 millilitres for UHT milk, and 600 millilitres for all other milk, and one litre. Now the reason that we stopped at 600 was an obscure one—the dairymen thought they would sell less milk if we converted our pint milk bottle to 500 millilitres. The answer to the question that you did not ask is that there is no three litre size.

MR. A. SANDERS (Scale Manufacturers Association): I was interested in Mr. Servin's answers to Mr. Shannon a little while ago about a voluntary conversion of retail food stores and such other competitors as grain elevators and so forth who deal with customers and whose customers may prefer to deal in the regular customary system. How are we going to get those converted over to the metric system?

I think, in many cases, it is a larger job than four hours to convert a good, big scale. In Canada, one of the things they would like to do early is to convert the retail food stores so their customers, the public, will begin to learn about the metric system.

Now did I understand you to say that within about three years you calculate that about 60 percent of your retail food stores will have their scales converted?

MR. SERVIN: I would think that within three years almost all of the retail food stores would be converted with the exception of what we would term the small corner stores where grandma and grandpa are waiting to die. At this point in time, about 60 percent of the industrial scales are converted.

MR. SANDERS: Industrial scales?

MR. SERVIN: Yes. The point that you have got to remember with the time I gave you, and I stressed it, is that it was average. Now the thing that you have got to remember when an average time is quoted is that in the case in point there are far more, shall I say, small capacity platform scales than there are vehicle or track scales. It may take twelve to sixteen hours to convert a vehicle or track scale; but when you pull them together in averages, it brings the figure down to about four hours average for the lot.

MR. SANDERS: We have the same problem you do about not having enough servicemen to make a fast conversion of all these

scales. Presumably, the servicemen are already busy or they would not have jobs. We thought some schedule could be worked out for scheduling these conversions to make an orderly conversion over a period of time; and Canada was thinking the same thing in the assumptions they made.

MR. SERVIN: This is true; and it is attainable in a country where there is no compensation in one of two ways. The first way is if you can do it as New Zealand is attempting to do it on an industry basis. For example, this may sound funny, just recently New Zealand changed all its fish and chips shops. I think sometime earlier this year they had a program whereby all their fruit and vegetable shops were converted to the metric system.

They are attacking their conversion system on an industry basis. One of these days they will get around to supermarkets and another time they will get around to hardware stores.

We did that in the industrial sector where all our wineries converted at the same period of time, all our paper mills at the same period of time, and so on; but we have not attempted it in the retail area because the shopkeepers have complained that if they are the only shop in an area that is converted they will be disadvantaged. Remember that supermarkets sell meat just as much as butchers sell meat so if you convert the butcher before you convert the supermarket, you have a little problem.

What we are trying, and it is difficult in a voluntary country, is to get people in a geographic area—such as a council, a city ward, or a city electorate—to all go over a period of time, say six weeks, so that any disadvantages are only for a short period of time in a given shopping area. After the first areas convert, the other areas suddenly realize that they are the ones at a disadvantage and they will want to go too.

MR. SANDERS: Thank you, Mr. Servin. You have made a valuable contribution to this problem we are considering.

MR. R. OGG (Illinois): We have a problem, or will have a problem, in the State of Illinois if weights and measures converts to the metric system. We are very unlucky; we control everything. What happens, or has it happened, in Australia or New Zealand in the guaranteed analysis of chemicals, fertilizers, and feeds which are on a hundred-weight basis?

MR. SERVIN: When you say a hundred-weight, you mean one-hundred pounds?

MR. OGG: Right, sir.

MR. SERVIN: Right, well most of your figures are on a percentage basis.

MR. OGG: Yes, sir. Some of them get down into the ten thousandths of one percent.

MR. SERVIN: Well, look, it is simpler in metric. I mean that. A milligram is one millionth part of a kilogram. It is as simple as that.

MR. OGG: The industry had no problem changing to it?

MR. SERVIN: No, none.

MR. E. H. STADOLNIK (Massachusetts): When the land is conveyed from one person to another, what is done about the description of that land because it is in acres? I wonder how the description is going to be handled in the future.

For precious metals the troy ounce is customarily used all over dering if any member of the panel would have any comments the world. The carat is used for precious stones. I was just wonto make on this.

MR. SERVIN: With regard to the land measurements, there are two alternatives and they have both been used with regular gay abandon. For instance, I believe if you go to Austria today you can still find some titles that are in the old customary system. In that country I believe they are converting titles as the land is transferred.

In Australia the Registrar Generals, the people who are in charge of titles in Australia, wanted new equipment. They wanted computers and they wanted to be able to justify them, so they said all titles had to be changed to metric. They got people to believe them. As a result they are getting beautiful computers and all the titles are being changed at that period of time.

There is no need to change the titles until you sell the land. In Australia, when speaking of land, the units used are square metres to hectares. Ten thousand square metres would take the place of about ten town blocks. After that the units are hectares or square kilometres, depending on how big the ranch is.

The system that we are going to at the moment for precious stones is the metric carat; although I think the Metric Conversion Board also believes that it will eventually die out and the unit to be used will be straight out the units of mass, of milligram and gram.

For the precious metals, once again we are waiting for America. The world's biggest bullion market is the London bullion market and it will not convert from the troy ounce until America decides what it is going to do. In South Africa and Australia, all gold is mined, worked, and recorded up to the point of sale in terms of the metric system. Then, because of the London bullion market, it is converted to troy ounces for sale.

TUESDAY EVENING—JULY 9, 1974

ASSOCIATE MEMBERSHIP RECEPTION

Conference delegates enjoyed a delightful reception on Tuesday evening, which was sponsored by contributors of the associate membership. Photographs of the reception and representatives of the sponsors are shown.

MORNING SESSION—WEDNESDAY, JULY 10, 1974

(LACY H. DEGRANGE, *Vice Chairman*, Presiding)

METRIC PLANS, PROGRAMS, PROBLEMS

The Metric Conversion of Scales As Viewed by the Scale Industry

by WILLIAM N. SHANNON, Vice President, Marketing,
Berkel Incorporated, LaPorte, Indiana

Many of you know the Berkel Company by its former trade name of U.S. Slicing Machine Company. The Berkel Group, a multinational company, is one of the largest scale and weighing equipment companies in the world; and Berkel scale production probably exceeds that of any U.S. scale manufacturer. Berkel Incorporated, the U.S. subsidiary, formerly made scales; and we anticipate a limited resumption of the U.S. manufacture in a very short time.

Prior to joining Berkel, I had been associated with Hobart and previously Toledo Scale. Through May 1 of this year, I served as chairman of the Metric Conversion Advisory Council of the Scale Manufacturers Association, as a member of the SMA Technical Committee, and on the SMA Board of Directors. Because many Canadian scale companies are subsidiaries of U.S. firms, I established a liaison with the Canadian Association of Scale Manufacturers; and I have met with the two co-managers of the Canadian Weights and Measures Task Force of the Metric Commission. With the soon-to-be accomplished resumption of Berkel scale manufacturing in the U.S., Berkel will apply to become a member of the Scale Manufacturers Association. I mention this background so that my remarks are not considered official Scale Manufacturers Association position statements.

You may find it useful to take notes as we look at the Canadian approach to metric conversion which appears to be moving from the investigative phase into planning, scheduling, and implementation phases.

Several of you may be interested in obtaining the comprehensive and detailed reference papers on which I will draw this morning, such as "The Official Canadian Weights and Measures Guidelines for Metric Conversion of Weighing & Measuring De-

vices Used in Trade," and the 76-page Metric Commission (March 1974) Task Force Report on the Metric Conversion of Weighing and Measuring Devices in Canada. If you are interested, please drop me a line at Berkel Incorporated, LaPorte, Indiana 46350.

I suggest that we look at the work that has already been accomplished in Canada in the investigative phase to see what might be in store for us in the U.S.

The population of Canada is approximately 22 million people, or about one-tenth that of the United States. When considering the following figures, is it realistic to consider that in the U.S. our scale population would be ten times larger than Canada? Remember, that is just a question.

- There are over 116,000 scales used in retail food stores in Canada.
- There are approximately 180,000 industrial type scales used in Canada outside the retail food industry.

To convert an estimated 217,000 retail and industrial scales in Canada, not considering those existing scales that will be merely replaced, 180,000 man-days or 758 man-years of skilled scale service will be required.

The total scale population in Canada of retail, industrial, and postal scales is estimated to be 346,000 units, of which 245,000 will be converted and 101,000 scales replaced. There are 730 scale service technicians in Canada. Just a rough first estimate yields an estimated $75 million to $100 million cost of converting Canadian scales to metric.

The Canadian Metric Commission Task Force on Weights and Measures was under the direction of two co-managers: Mr. John Armstrong, who was formerly chief of weights and measures with the responsibility for the entire program of type approval and device inspection for all of Canada; and Mr. Don Kendall, who was formerly chief scale engineer of Toledo Scale, Toledo, Ohio. Mr. Kendall has been associated with the scale industry for over forty years; for ten years he was chairman of the Technical Committee of the U.S. Scale Manufacturers Association which contributed knowledge to the U.S. Metric Study.

According to the Task Force, it seems clear that retail devices used in trade—principally gasoline dispensers, post office scales, and retail food store scales—are key elements in creating awareness of metric conversion. They are highly visible and, if converted early in the overall plan and on a schedule carefully coordinated with an effective program of public information, will

help create a climate of acceptance so that the Canadian public will rapidly come to "think metric." Given this climate of public acceptance, all other elements of metric conversion will slip into pace with minimum friction.

	Leadtime.	Years	Amount of increase service force
Postal scales	1 year	2–6 months	
Retail scales	1½ years	2 years	16–20 percent
Industrial scales	Some now	6 years	25–30 percent

The Canadian Government will not subsidize conversion. The official guidelines for metric conversion of weighing and measuring devices state:

- Metric conversion is to use only parts supplied by the original manufacturer of the trade device or by an organization to which the approval certificate was issued, unless written permission to use other parts is granted by the Directorate of Consumer Standards.
- The weights and measures regulations make no special allowances for metric conversion.
- Inspection following conversion, in most cases, will be to "in service" limits of error.

There has already been formed a working group on scales in the retail food industry in Canada looking at retail scales which may be converted by the end of 1978.

Retail Trade Scales

Type of scale	Total number	Converted	Est. cost of conversion	Number to be replaced
Computing cylinder or projection	61,000	48,000	$ 160 180	 13,000
Computing fan	15,000	12,000	90	3,000
Automatic labeling	5,000	3,500	1,500 Min. 3,000 Avg. unit	1,500
Even arm	3,500	3,000	100	500
Spring hanging	2,600	2,000	40	600
Floor	3,100	2,700	500 Beam 200/800 Dial	400
Miscellaneous portable platform	26,600	18,000	250 Port. beam 100/200 Soft dial 400 Hard dial 1,000 Printer	8,600
Totals	116,800	89,200		27,609

The report indicates that in Canada there are about 730 scale service technicians. About 440 specialize on retail type scales or can work on both retail and industrial. The remaining 290 servicemen specialize on industrial type scales. For the various types of scales in the retail food industry, a man should average two scale conversions per day. Not counting floor and miscellaneous scales, the retail total is 68,500 scales to be converted, or 34,250 man-days. Assuming 240 days per year, 72 retail scale servicemen would be required, or 16.5 percent of the 440 man service force. Similarly, 7.5 percent of the 290 man industrial scale force would be required to convert the floor scale and miscellaneous types used in retail. Since other industrial type scales would be converted at the same time, the Canadians believe a 16 percent to 20 percent increase in the technician work force, or an equivalent amount of overtime, would be adequate for a retail scale conversion program extending over two years.

Industrial Scales

Type of scale	Total number	Converted	Est. cost of conversion	Number to be replaced
Even arm	28,000	22,500	$ 150	5,500
Portable, bench monorail	110,000	77,000	350 Beam 400 Dial	33,000
Platform hopper—crane—truck	39,000	27,000	1,000 Beam 1,000 Dial	12,000
Railroad	900	600	3,000	300
Dump conveyor	1,400	1,050	2,000	350
Totals	179,300	128,150		51,150

The Canadian Task Force believes that a skilled technician should be able to convert two even arm scales or one portable, bench, or monorail scale per day. Larger scales would require two man-days per scale. This comes out to 146,000 man-days. Using a 240 day year for six years, about 100 service technicians will be required full time. In Canada there are 370 technicians qualified to convert industrial scales, but some would not be available during retail scale conversion period. One hundred men full time represent a 27 percent increase in the technician work force. An increase in the work force of 25–30 percent with some overtime work because of equipment unavailability will be required.

Postal Scales (Government and Private)

Type of scale	Total number	Converted	Est. cost of conversion	Number to be replaced
Beam letter	21,520	None	—	21,520
Beam parcel	6,540	5,200	$ 40	1,340
Computing fan	16,350	16,350	90	—
Computing cylinder	5,300	5,300	200	—
Miscellaneous	600	600	250 Beam	—
Totals	50,310	27,450		22,860

It would be more likely to take two to four months to convert the Post Office scales and six months to convert privately owned postal scales, assuming retail food store scales were not being converted at the same time.

Number of Weights

10 pounds or smaller	152,000
11 pounds–30 pounds	16,500
31 pounds–250 pounds	89,000
Over 250 pounds	2,500

The application of weights by industry is:

Retail Food Industry:	14,000 weights on even-arm balances
Industrial Application and Non-Retail Food:	196,000 weights on even-arm scales
Scale Calibrating Use:	50,000 weights

For automatic prepacking label scales, the Task Force believes that for $300, a unit reading 25 pounds by .01 pound could be converted to 11.5 kilograms by 0.01 kilogram, only the scale unit would be affected. A stiffer spring would be installed, the scale adjusted to read in kilograms instead of pounds, and the overload stop set at just over 11.5 or 12.0 kilograms instead of just over 25 pounds. With the present scale, a 2.205 pound piece of meat at $2 per pound would be priced at $4.40 or $4.42 depending on whether the scale read the weight as 2.20 pounds or 2.21 pounds. On the converted scale, a 1.005 kilogram piece of meat at $4.40 would be priced at $4.40 or $4.44. Since these scales are used to price random packages, the Task Force believes neither the consumer nor the merchant would be expected to suffer. This simpler method could be used on scales of a limited life.

Taylor Soper, formerly of Fairbanks Weighing Division, stated in a March/April 1974 article in the "Metric News" that graduation size needs to be investigated. Using an example of a 50 ton truck scale converted to a 50,000 kilo scale, the conventional dial

could have been 100,000 pounds by 20 pounds with a primary chart of 20,000 times 20 pounds and four unit weights. The basic tolerance of a 100,000 pound scale at full capacity is 100 pounds acceptance and 200 pounds maintenance, presently 5 and 10 graduations if the converted scale is 50,000 kilos, the avoirdupois tolerance at maximum capacity would be 110 pounds acceptance and 220 pounds maintenance. So basic tolerances should increase only the same amount as the scale's capacity was increased. Basic tolerance at capacity would be 2.2 graduations acceptance and 4.4 graduations maintenance.

The estimated charge for changing the dial to a primary chart of 20,000 kilos times 20 kilos (44 pounds) would be $200 and would involve only the change of a shelf lever and disablement of the third and fourth unit weights. The estimated charge for conversion of the existing 20,000 pound chart to a 10,000 kilo chart with corresponding tare and printer changes is $700 to $800.

For scale conversions the scale manufacturers must learn from the scale owners their needs in order to determine suitable specifications. The scale industry manufacturers will then design new charts, get acceptance of weights and measures, provide tooling, provide engineering for ease of conversion, order raw material, and begin the manufacture of parts for conversion of existing scales while also manufacturing new metric scales for those scales to be replaced rather than converted.

To accomplish this, the scale industry will have to make considerable investment in development and inventory in preparation for conversion. This investment will be made once it is known what is wanted in terms of scales and if reasonable assurances can be developed that agreements on parameters and timing will be held.

The scale industry, the scale users of all industries, and weights and measures officials must work together if our hopes for metric conversion in the United States are to go forward.

METRIC PLANS, PROGRAMS, PROBLEMS

Petroleum Industry

by KEITH E. BAILEY, Manager of Operations,
Williams Pipe Line Company, Tulsa, Oklahoma

I appreciate the opportunity your group has offered me of being able to discuss with you the American petroleum industry's position with regard to metrication. I feel this is an appropriate forum for this discussion, and that you people represent the key to a rational and efficient implementation of the metric system of measurement in United States commerce.

Yesterday, and again today, you will hear reasons for the need to convert to metric. What I hope to do is give you the petroleum industry's points of view, its current program, and its outlook for the future after which I will participate in the panel and will be happy to respond to any specific questions you might have.

When I say I am presenting the petroleum industry viewpoint, you must realize that I am speaking as a member of the American Petroleum Institute's (API) Committee on Petroleum Measurement (COPM) which is a nondivisional committee. As such, we are charged with developing overall measurement policies, procedures, and standards which, in turn, are reviewed and adopted as applicable by the various divisions within API.

I am sure you can appreciate that the different major divisions (production, refining, marketing, and transportation) have different needs and pressures acting on them. Beyond that, individual member companies also have widely varying situations. In essence what I am saying is that while I am presenting the API position, this is a consensus position and within the industry I am sure you will find a wide diversity of individual opinions on this subject. Many of the multinational majors have already begun conversion efforts while other domestic companies such as mine will, in all probability, delay changes until the latter phases of the industry timetable for overall conversion.

Last year Frank Ikard, president of the American Petroleum Institute, stated in a letter to the House Subcommittee on Science, Research and Development:

"In recognition of increasing worldwide acceptance of the metric system . . . the API supports immediate federal legislation initiating domestic conversion to metric units. This support recognizes the need for a coordinated and orderly conversion, executed in a rational manner to facilitate and encourage standardization efforts nationally that are compatible with such efforts worldwide."

This statement, in a very brief summation, outlines the petroleum industry's commitment to metrication. There is no equivocation with regard to need nor is there with regard to timing.

I would like to analyze this position for a minute. The American petroleum industry, by and large, has moved from being a predominantly domestic industry to being a predominantly multinational one. Very few of the companies within the industry can limit their activities to strictly domestic transactions. Even small landlocked marketing companies are being forced into the international arena to secure supplies. This forces them into conducting business in international units of measure which, of course, are metric.

As the balance shifts from predominantly domestic transactions to a significant percentage of international transactions, the logic supporting dual measurement systems is negated. This has been true within individual companies in other industries who have begun total metric conversion, and it is true in our industry. There is little justification to support dual measurement systems, with the inherent cost of dual training, engineering standards, accounting, etc.—particularly when one system is rapidly losing any semblance of international support.

I will not go into the merits of the technical aspects of the SI metric system as compared to our customary units; I think you are all familiar with these. Obviously, if scientific merit and logic were the only basis for our selection of measurement units, we would have adopted the SI system long ago.

This alone, of course, does not provide any tangible incentive for change; and the view I hear expressed frequently in my work with the energy sector of the American National Metric Council is that a real economic need for change will be the primary basis for changes which are made. This can take the form, as it has in our industry, of the majority of supplier and/or consumer nations utilizing the system and imposing its use on us if we are to engage in trade with their countries. As primary industries adopt metric standards, the residual effect will be to force support industries into adopting them. This seems to me to be the avenue we are currently taking; and it is one which has the potential for great inefficiencies in the conversion process if it is not supported by Federal, State, and local legislation.

With the current lack of any firm governmental direction, the petroleum industry is attempting to establish consistent and rational timetables and standards for conversion within the industry. Total conversion will still be dependent on government action; however, we are moving very rapidly toward a metric standard for all areas except direct domestic consumer sales. Our conversion process will take the form of both hard and soft conversion. At this point in time, our effort has primarily been that of soft conversion.

Over the years, the API has developed a number of standards which, in turn, have become international standards on either a formal or an informal basis. These are standards which must be maintained if we are to minimize the ultimate cost of metric conversion. In order to assure this posture API, in conjunction with the American Society for Testing Materials (ASTM) and the American National Standards Institute (ANSI), is cooperating in presenting many of these standards for formal adoption by the International Standards Organization. This in turn would, in effect, unify worldwide petroleum standards. Specific standards currently being pursued in this area are viscosity classification systems and a standard set of base conditions for volumetric measurement of oil and gas.

Other current activities include joint efforts with the American National Metric Council's energy sector, which I chair and whose overall range of activity Dr. O'Hagan outlined yesterday afternoon.

The API Committee on Petroleum Measurement has recently published API Publication 2564, entitled "Conversion of Operational and Process Measurement Units to the Metric (SI) System." This will complement the joint API-ASTM-ANSI Metric Practice Guide publication; and its purpose is to encourage uniform selection and equivalence of operational and process measurement units while also accomplishing three other more general goals:

1. The user's knowledge of the SI system is supplemented by information specifically designed for use within the petroleum industry.
2. The users are very clearly alerted to the fact that the API envisions them having to do an ever increasing amount of their business in SI units.
3. The users are encouraged to commonality of SI usage by simplified tables which are provided for that purpose.

The publication does make four rather significant changes which are directly related to your area of activities. API gravity and

specific gravity are to be eliminated from usage and be replaced by absolute density and relative density respectively.

Base conditions for the preceding parameters as well as volumetric measurements for oil and gas will be established as 15 degrees Celsius and 191.325 kilopascals.

Finally the volumetric units of barrel and gallon will be replaced by cubic metre and cubic decimetre respectively.

API's Committee on Petroleum Measurement has set a ten-year goal beginning January 1, 1974, for the elimination of these units of measure from all API standards. In addition, as API standards are reviewed and reissued, they are being converted to SI units as the preferred unit of measure.

Corollary to COPM's activities, the API has an Advisory Committee on Metric Planning which is coordinating the activities of metric subcommittees within the various divisions. This committee is primarily concerned with implementation and has active studies proceeding on the formulation of standard employee training techniques which will be used during the conversion period. It also is attempting to identify other areas within the industry which can best be accommodated by a unified industry effort.

I could go on and discuss other specifics of our activities, but in summary I think you can see that:

1. The petroleum industry has established, to its satisfaction, the economic incentive to commit to metrication.
2. The petroleum industry has already begun a comprehensive conversion process both collectively and individually.
3. The petroleum industry will continue to be active in encouraging any action by any body, either private or public, which it deems necessary for a rational systematic conversion.

We solicit your support in this area and are prepared to work in any way we can to support your efforts.

METRIC PLANS, PROGRAMS, PROBLEMS

Metric Conversion for Gasoline Dispensing Systems

by ALFRED C. EVANS, Director of Engineering,
Petroleum Products Division, Veeder-Root Company,
Hartford, Connecticut

INTRODUCTION

At the interim weights and measures meeting in January, Veeder-Root made a presentation during the session on the energy crisis which was directed toward three major areas of concern in gasoline dispensing. These three areas included:

1. Inability to post a price in excess of 49.9 cents per gallon on some older computers and to display a total sale beyond $9.99 on many 3 wheel computers.
2. Price of gasoline exceeding 99.9 cents per gallon.
3. Metric conversion.

Subsequently, the Specifications and Tolerances Committee's tentative report under the subject of "Code for Liquid Measuring Devices" made recommendations regarding these areas of concern as follows:

1. It is the committee's view as an interim measure that the Office of Weights and Measures' memorandum of December 6, 1974, that recommends setting the variator at one-half the unit price, etc., be officially recognized in all jurisdictions until modifications can be made.
2. The appropriate modification of gasoline dispensers would be extending the variator capability to 99.9 and a 4 wheel ($99.99) total price indication.
3. The $14.99 modifications of gasoline dispensers would have a limited life and eventually a fourth wheel total price indication would be necessary. This modification would only be appropriate for sales not exceeding that amount.
4. The committee's long range solution for this problem is to encourage the American Petroleum Institute to take immediate action and initiate the use of the metric system throughout the petroleum industry.

As a background for further discussion particularly related to metric conversion, the illustrations show the computers covered by the S & T report.

Figure 1 shows a 3 wheel limited range computer where the maximum price setting as shown is limited to 49.9 cents per gallon. This is generally the configuration which concerns the one-half gallon pricing consideration.

FIGURE 1. *3 Wheel—Limited Range Computer.*

In the computer shown in figure 2 the price posting capability is extended to 99.9 cents per gallon. In the rebuilding of this computer the maximum sales capability is extended to $14.99. The gallons display is limited to 99.9 gallons.

FIGURE 2. *3 Wheel ($14.99)—Full Range Computer.*

Figure 3 shows the 4 wheel full range computer which has been in production since 1969. The maximum price posting is 99.9 cents per gallon; and the total sales display goes up to $99.99 while gallons displayed are extended to 999.9 gallons.

FIGURE 3. *4 Wheel—Full Range Computer.*

As we approach the problem of metric conversion we are concerned with how to effectively accomplish a transition from gallons to litres. This involves not only the gearing changes required, but also a display consistent with anticipated sales value (dollars and cents) and quantity delivered (litres).

The objectives in such a transition must consider: (1) the least confusion to the consumer, (2) the ability to effect a quick change enabling a station or a region to convert in a short interval, and (3) a minimum cost for the changeover.

Reading from the "Interim Report, U.S. Metric Study," NBS Special Publication 345–3:

> A mechanical gasoline dispensing system is composed of three basic parts: (1) a pump, (2) a meter, and (3) a mechanical computer. The pump, usually a positive displacement type, forces the liquid (gasoline) through the meter (which contains a series of rotating adjustable calibrated chambers). As the chambers rotate they drive a shaft-gear mechanism which is connected to the computer. The computer records, for any set price per gallon, the total gallons delivered and the total sale in dollars and cents.

In order to adapt these systems to metric units, the gearing between the meter and the computer must be changed. Likewise, computers which have only a 3 wheel display in the quantity section and only provide for readings up to 99.9 litres (equivalent to 26.4 gallons) would probably be considered inadequate.

As there are 3.785 litres per gallon, the gearing must reflect a speedup of 3.785 to 1. It is possible to effect this change on new gasoline dispensers, which typically have 4 wheel computers, by designing the system so that the output of the meter is increased by this factor and the computer remains unchanged.

The presentation would then be as shown in figure 4. This is a repeat of figure 3 with the dial face indicating in litres. Total sales capability is $99.99, total quantity display is 999.9 litres and price posting in cents per litre is more than adequate to permit price setting in excess of $1.00 per gallon. This would probably be the most effective approach on new pumps once the changeover to the metric system has been accomplished.

The problems we are confronted with, however, are:

1. The vast number of existing dispensers to be converted, and
2. What to do about new pumps produced today which deliver in gallons and will later require conversion to litres.

FIGURE 4. *4 Wheel—Full Range Computer (Litres).*

A proposed solution is a "quick change" gear box which is readily attached to the underside of the computer. As the name implies, the conversion from gallons to litres could be quickly accomplished in the field. Figure 5 shows such a gear box. The gear box is easily attached to most computers in the field today, although in some pump applications slight sheet metal modifications are required. Initially the gear box is operating in a mode whereby the gear ratio is 1:1 and the display is in gallons.

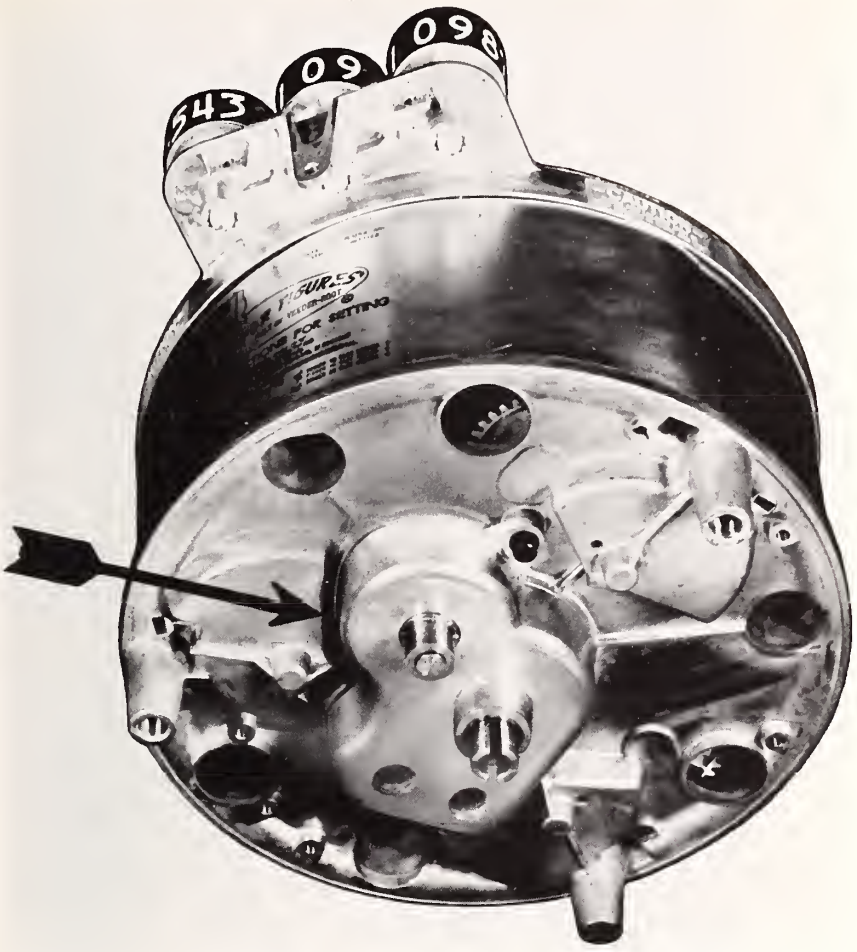


FIGURE 5. *Quick-Change Gear Box.*

When the time for conversion to the metric system arrives it is a simple procedure to remove the clip and shift a shaft to the litre or "in" position. This is an irreversible change and results in the computer being speeded up by a factor of 3.785:1. It is possible, too, that in some dispensers recalibration of the meter will be required.

Figure 6 shows a 4 wheel computer with the quick change gear box in the gallons mode. In figure 7 the gear box has been changed over to the litres mode. The price per litre, 21.1 cents, is equivalent to 80.0 cents per gallon so both computations result in the same sales display.

The use of a gear box is, admittedly, not a new concept. A convertible gear box of the type described, however, affords the

FIGURE 6. *4 Wheel Computer With the Quick-Change Gear Box in the Gallons Mode.*

opportunity to gradually update equipment over the next several years in such a manner that they will be readily convertible in an orderly fashion to the metric system. New pumps produced today could likewise be built with a gear box, enabling a quick change as required.

A convertible gear box is currently being manufactured for installation on computers in new pumps produced in the United Kingdom prior to the conversion date to litres.

FIGURE 7. *4 Wheel Computer With the Quick-Change Gear Box in the Litre Mode.*

In Canada, where metric conversion is probably more imminent than in the United States, this approach is being seriously considered.

Although no one likes to think of gasoline exceeding 99.9 cents per gallon, the possibility should be considered. If gasoline does

reach a value greater than $1.00, a quick conversion to the smaller unit of quantity—the litre—could be the practical solution. The price posting limitations of today's computer would then be alleviated.

A FURTHER LOOK TO THE FUTURE

Possible higher prices of gasoline and increased flow rates may be required in some applications. The result will be increased speeds in the computer wheels with resulting effect on life. We are, therefore, proposing a right hand money wheel which has a value of 20 cents per revolution rather than 10 cents per revolution. In this way the right hand money wheel speed will be reduced by one-half. We have chosen 20 cents per revolution because the visual change in the presentation is relatively insignificant, causing least confusion to the consumer.

Figure 8 shows a 20 cents per revolution presentation. Note the two money wheels which represent cents are reduced in size. The aperture is likewise reduced with a clip-in mask. Each cent is identified with a character as in the standard display.

It is felt that truck stops and self-service applications where pulsers are added and driven from the right hand wheel will be the first to require equipment of this type. In this connection, the future potential self-service will be significant.

SUMMARY

In summary, we are proposing that a quick change gear box be mounted to the underside of the standard 4 wheel full range computer at this point in time. This would apply to new computers, rebuilt computers, and 4 wheel computers in the field. The gear box will then provide the means for a rapid transition to the metric system in the future with minimum confusion and cost.

FIGURE 8. *X3101 with 20¢ Right Hand Money Wheel and Gear Box.*

The Implications of Metrication for the Packaging Industry

by WILLIAM E. YOUNG, President,
William E. Young and Company, Neptune, New Jersey

As most of you know, the metric system was designed by a group of French scientists, and imposed by Napoleon on the countries that he conquered. If he had won at Waterloo, both England and we might, today, be metric countries. Prior to Napoleon's conquests, all countries had different systems of measurement, most having a basis related to that of the English system, such as the length of some man's foot or the weight of a particular stone in the king's palace.

The length of the meter is based on a decimal portion of what was believed to be the circumference of the earth. This distance was engraved on a platinum bar kept in Paris and still remains the metric standard of length, even though the earth's circumference has been found to be different from what it was thought to have been when the first meter bar was made.

The gram, the metric unit of weight, is based on the weight of a cubic centimeter of water, which certainly is a practical value. But the real value of the metric system lies only in its making use of the decimal system rather than fractions.. This makes all calculations easier and reduces the chance of arithmetical error. If the English system had been modified on a decimal basis, it would be just as useful as the metric system. The English have finally been smart enough to decimalize their monetary system, along with adopting the metric system.

Going metric is regarded by the public in general as a terrible thing. Housewives are afraid that they will be susceptible to being cheated by merchants, since they think the metric system is too complicated for them to learn. But their children are already learning the metric system in many of our schools; and I am sure that they can help their mothers when they go shopping in a metric supermarket.

One educator expressed the thought that the best part of a year might be saved in elementary education if fractions did not have to be taught the way they have been in the past. Children would be taught the decimal system as now; fractions would be covered, but briefly. If this educator is correct, perhaps

we could assure that the year saved would be put into giving our children a real ground work in biology, chemistry, and physics at the secondary school level. This could mean that our lawyers, who generally go to arts school where the sciences are not stressed, would be able to vote more intelligently on legislation should they be elected to Congress. Just about every bill pending in Congress has technological implications, and very few of our legislators have enough science in their backgrounds to intelligently evaluate these implications.

Business is also afraid of the metric system. The retailer thinks he will have to buy new scales, stock new containers, and be plagued with having to teach his clerks how to operate metrically. The food manufacturer is afraid that he will have to get new packaging machines to handle different size packages because of the metric changeover. Can manufacturers are concerned that they will have to completely retool their equipment in order to turn out metric cans. Machine shops are worried that they will have to go out and buy metric machine tools and discontinue use of most of their present equipment. But, I cannot see that any of their concerns are based on fact. These people just do not understand how the change to metric will come about and how little it will really cost for most businesses. Retailers' scales, for example, need only a new card placed in them to adapt to metric.

If one goes into the supermarket, one will find packages of many items, such as detergents, with contents of strange numbers like 31½ ounces. All that will happen someday is that the same package, with the same contents, will, in addition to being marked 31½ ounces, be marked 893 grams. Years later, the ounces will be omitted. If one wants to compare prices between two of these products, it will be easier to calculate directly with grams rather than get involved with fractions of ounces and pounds. Cans will be treated in exactly the same way. Today, they are identified by numbers; and a given can, when fillled with dried mashed potato flakes, will weigh a lot less than when filled with string beans in their liquid. So why bother to change the can size anymore than one would change the size of the detergent package?

Some confusion will occur where things are weighed out, such as meat, vegetables, and delicatessen items. But in these days of prepackaging, one rarely finds a package of fruit or hamburger that weighs exactly one-half pound or one pound. The clerk still must compute a price to put on this package; and eliminating the involvement of ounces with pounds will simplify the task. Additionally, most supermarkets have scales that automatically print

a label with the weight, unit price, and total price, which is affixed to each package.

If the housewife merely remembers that a kilogram is just a little bit over two pounds, and that 500 grams is about 10 percent over a pound, she will not have any problems in giving the clerk some idea of how much she might want of a particular item. When buying yard goods, she will work with a meterstick instead of a yardstick. Once again, the meter is just a little longer than the yard, so I think she will be pretty much at home with meters when she buys material for her draperies. My secretary informs me that dress patterns now contain the metric dimensions as well as the English dimensions.

The construction industry will be a slow one to convert to the metric system—the sizes of doors, windows, bricks, and cement blocks will probably never be changed. All do-it-your-selfers who purchase lumber know that nominal lumber dimensions, such as 2′ x 4′, yield a piece of lumber considerably smaller. The dimensions of water pipes are quite different, when measured, from their nominal size. So even in the construction industry there will be no need to make any changes. Certainly, when innovations enter into the construction industry, metric sizes will ultimately be used. But these will in no way affect the cost of these new products.

In oil fields, all of the mechanical components used throughout the world, including Red China, are made to U.S. designs; since we and Howard Hughes' father really built it into what it is today. There will certainly be no reason to make changes here, since compatibility of new equipment with the old is essential. Someday, perhaps, these various components will be reidentified in accordance with some metric nominal dimensions, but I rather doubt it.

Now, I will get back to packaging. In the pharmaceutical, optical, and photographic industries, the metric system has been used for many years. Only the drugstore continues to use the English system in connection with certain prescriptions; but this will quickly pass at no cost to anyone. When it comes to food, packagers will eventuallly change the containers of packages to round out weights in metric terms—the one-pound package weighing 454 grams may end up as either 400, 450, or 500 grams. Free flowing products sold by net weight are measured into containers by automatic filling equipment, which can be simply adjusted to meet these small changes.

Some costs will be found with items that are sold volumetrically, such as milk, bleach, and the like, since changing the tooling necessary to produce containers to hold a different volume is

expensive. But these containers are changed periodically for marketing or economic advantages, and replacement of the present ones will occur gradually and without any more expense than if the new containers were made to hold English measured contents.

Products such as vacuum packaged sliced luncheon meats, now on the market in weights of 4, 6, and 12 ounces and one pound, may end up supplied later in 100, 200, 300, and 400 gram packages, resulting in a lower unit cost. But when the Government adopts the metric system, it will undoubtedly set up weight guidelines or requirements for many products; and these packages may end up weighing 125, 250, 375 or 500 grams. I think, however, to make price comparisons easier, the Government will probably stick to even 100 gram weights for such packages.

Insofar as packaging equipment is concerned, most of it will be readily adjustable to meet any new metric standards. But since most packaging equipment is amortized in somewhere between five and ten years, I believe that marketing pressures will encourage the equipment manufacturer to begin to redesign so-called fixed-size machines to meet metric dimensions. The packager is always looking for something new to catch the housewife's eye, so why not come out with his new package in metric dimensions? It certainly will not cost more.

Insofar as machine parts are concerned, one already finds a high percentage of packaging and other machines in this country using metric sized anti-friction bearings. These are used as a matter of convenience, since the metric dimension just happens to fit better into the machine than a bearing with a nominal English dimension. So, since metric bearings have caused no problems to machine builders working in the English system, English sized bearings will still continue to be used indefinitiely and cause no problems in a metric world. English bearings have been used for years in metric countries for the same reason that we have used metric bearings.

Major changes will eventually occur in the steel and nonferrous metals industries. Along with English sizes, metric sizes of bars, sheets, and other shapes will begin to be offered; and the only important added cost will be debt service on inventory. Rolling equipment is already adjustable to produce different sizes from those now being produced; and many American mills are already supplying metric dimensioned products abroad.

Just about every machinist has worked with the metric system. The metric dimensions are converted to English dimensions on the drawing board, and the necessary machine operations are performed. Eventually, when machine shops buy new metric equip-

ment, the machinist will not have to make these changes. When parts are built on metric machine tools to English dimensions, the engineering department will have already turned out drawings converted to metric dimensions so that the machinist will not have to stop and make computations before performing an operation. Insofar as machine maintenance is concerned, additional inventories will have to be carried on items such as nuts, bolts and washers; but installing metric dimensioned components presents no different problems than those with present English components.

The English Board of Trade has adopted a series of standard weights as follows: 25, 50, 75, 125, 250, 500, 750 grams, and 1, 1.5 and 2 kilograms (thereafter multiples of one kilogram). These values are about 10 percent heavier than the nearest old English unit of weight, and the packaged product produced will, therefore, sell at about 10 percent more than its former English equivalent. I feel that housewife psychology would make it more desirable for us to go to a series that weighs a little less than its nearest English equivalent, such as the 100, 200, 300, and 400 gram series. This would result in a lower unit cost per package, and might even help the weight watchers program!

The English study to develop new metric screw thread standards has included trying to improve screw thread technology. They have tentatively adopted a single series of pitches for their new thread diameters rather than the two series now used here. This will ultimately reduce fasteners inventories in half. Along with improving the shape of the thread, the new fasteners will, all in all, be an improvement over either existing metric or English fasteners.

In the packaging industry, we are all confused by the number of different ways currently in use for expressing weights of paper; for example, a 20-pound bond paper is almost twice as heavy as 20-pound kraft paper, and 26-pound linerboard is three times as heavy as 25-pound kraft paper. These weights refer to specific ream sizes, which are sometimes 480 sheets and sometimes 500 sheets. In plastics, we talk about square inches per pound, when polyethylene resin, paid for by the pound, is sold to the final customer at so much per thousand square inches of film.

Metrication offers a wonderful opportunity for all of the systems of specifying packing materials to be readily understandable, so here is one more example of where it will be of benefit to our packing industry. When the Government finally sets standards on packing sizes, it will also offer the packager an opportunity to reduce the number of different sizes of packages, simplifying the retailer's inventory and shelf space problem. We might

also consider selling more products by volume, rather than by weight, even though the weight would be noted on the package. Products of different density could be put into standard containers and sold by the liter or multiples thereof. We now sell paints by volume—pints, quarts, gallons, etc. Just imagine, if we sold paints by weight, how many difierent container sizes would be required because paints vary so much in density.

Export sales are bound to improve once we get into the system used by the rest of the world. Our only important customer not using metric today is Canada, and they are ready to change to metric the minute we do. It would be impractical for them to make this change before we do, since so many Canadian companies are owned by or affiliated with American companies and are now turning out the same types and sizes of products.

Summing up, changing to metric may be costly to some segments of our economy, but would be of great benefit to all of us in the long run. If the changeover is done intelligently and over a period of, let us say, 10 years, I think its cost will be just about unnoticeable in our general economy. Intelligence also dictates that no changes be made in many items, such as some of those things mentioned before in the construction or oil industries. The change to metric will not be a monster—it will be a normal evolutionary process bringing us into step with the rest of the world and providing many benefits that I am sure even those of us who have studied it do not fully appreciate today.

METRIC PLANS, PROGRAMS, PROBLEMS

NCWM Committee on Metric Planning

Presented by EDWARD H. STADOLNIK, Head Administrative Assistant, Division of Standards, Executive Office of Consumer Affairs, State of Massachusetts

Since the report of the Committee on Liaison will be presented later this morning, I am not going to comment too greatly on it at this time. It will be read to you, and at that time you can ask questions or make any comments or suggestions in relation to it. I would like to address my comments this morning to potential opportunities that do exist to improve and expand our role in weights and measures administration. Improvements could be brought about through the change to the metric system. I have selected several of the items listed in the goal and work plan of the final report of the Committee on Liaison as a guide to these comments.

One of the most important segments that we in weights and measures will have to deal with will be an analysis of our state and local laws and regulations and a determination of what amendments should be made to remove obstacles to metric conversion. We all have to take steps to review all aspects of our state laws and all aspects of local ordinances covering all areas where amendments will be required for the use of metric units. Now this will provide each jurisdiction also with an opportunity to review the entire range and scope of their weights and measures laws.

In all areas of regulatory, enforcement, and administrative organizations, metrication could prove to be a vehicle for receptive legislative action in the modification of existing statutes in all areas of weights and measures administration. That could include restructuring of departmental organization as well as developing additional staffing requirements. In other words, we should not limit ourselves merely to the matter of reviewing those parts of our laws that will only deal with metric alone. Let us also take a good look at what we have in our state and local laws and determine what is there based on tradition and what is there based on laws that were passed in colonial days that we no longer use. This would give us a good opportunity to clean up our law and maybe go into new, different directions.

Another possibility, based in part on offers such as Ralph Barra's offer of assistance on Monday and some comments that were made by Dr. Betsy Ancker-Johnson yesterday, is whether or not we want to expand our scope of measurement services. Can we use metric conversion to bring us to new fields in light of a new measurement language?

In many states there are programs being conducted that extend beyond the traditional weights and measures programs. If I may take the State of Massachusetts as an example, we in the Division of Standards have a Program in Clinical Thermometry, which we have had for many years, that fundamentally relates to the mercury in glass instruments. In recent years we have had a development coming into the field of clinical thermometry that dealt with digital electronics systems. We have had requests from the Division of Hospital Services and from many of the major medical institutions in Boston to analyze these instruments. We are now also working with the ASTM in developing new standards for testing and design of electronic clinical thermometers.

We also test gasoline, including octane testing, motor oil for viscosity, heating oil and antifreeze, all generally quality standards for determinations made through measurement processes. Again, I know there are many other states that have played leadership roles in the development of these quality standards.

Should we, in our State, plan goals for broader ranges of temperature measurements? We have in our codes for liquid measuring devices the permissive use of temperature compensators when you are taking temperature measurements. In testing compensating systems, how do you know your thermometers are accurate? What standards do you have to prove the accuracy of these instruments while you are testing vehicle tank or bulk storage metering systems?

We get into cryogenic measuring devices. Again, we are dealing with temperature ranges. We may be receiving requests for standardizing services from State environmental or occupational hygiene offices.

Should we pursue the need for acquisiton of standards for standards cell calibration in Massachusetts? Should this be something that we should offer the electronics industry to have within the confines of our State a measurement center to which they can take this particular device for standardization in the same way that they bring in their standard weights for traceability purposes? Or should we consider opening up into the laboratory calibrations of certain classes of Johansen blocks to weigh segments of our tool industry?

Planning for use of a new measurement language can readily provide the impetus to review our whole program of weights and measures administration—on state, county, and local levels.

Another one of the outlines in the report deals with packaging and labeling practices. Will the change to the metric system provide a real opportunity for the National Conference on Weights and Measures to take constructive action to explore the need for a rational program of standardization of package sizes within a broad range of commodities that make up a significant portion of the market basket?

It has been alleged that the advent of unit pricing has eliminated the need for standardization of packages. However, this has yet to be proved. If the weights and measures community does not set objectives in this field, I believe other consumer-oriented organizations will seek implementation of such requirements.

I was glad to note that the previous speaker acknowledged the need for standard sizes and, indeed, accepted the supposition that standard sizes would become, in effect, a reality.

Another area that deals with the work plan section of the report is the development of training programs for weights and measures officials. As we develop plans for training—metric training programs—it will also provide an opportunity to review our entire educational approach for our weights and measures inspectors, beginning with fundamental concepts of the science of measurement, introduction of statistical concepts, review of mathematics, introduction to laws of physics—all requirements in the increasing sophistication that we now face in weights and measures administration.

From these stepping stones we could further develop training sessions in law, investigation, and specialized areas relating to device examination, to name only a few types of ramification and variation. Again, if we develop a program that is merely going to be related with how we deal with metric terms, I think we will be missing the boat. Let's sit down and develop a real program of education to provide our inspectors with the proper tools and the proper background so that they can function effectively in the field.

Another comment is on promotion of metric—consumer educational material for consumers. Since we lay claim to being weights and measures experts, we will be called upon to address consumer groups, civic organizations, industry, to appear on radio and television, and to take on speaking engagements relating to metric conversion.

We should plan an effective metric presentation, but by no means let it stop there. Take the opportunity to devote at least as much time in your talk to spreading the word of what we do in weights and measures. Let the public know what we are doing and seek their support. Let it be a National Weights and Measures Week fifty-two weeks of the year. Particularly, in these inflationary times, we must let the public know that good measurement means money saved.

I might comment further, when you are making your presentation to a group of consumers, do not try to scare them or become overly technical. Try to reassure them that the change to the metric system will not be a drastic thing to understand.

Several weeks ago I gave a talk to a group of nutritionists at the University of Massachusetts. One of the first things I did was to give them a handout listing all the prefixes and terms relating to systems of mass, length, and volume dealing with the kilo, kilogram, hectogram, decagram, decigram, centigram, milligram, and so forth.

People are confused by these prefixes. They must be reassured that they will not be using most of these terms. The general terms in use for measurement of weight would probably be kilogram, gram, and milligram. Dealing with volume, the terms kilolitre, hectolitre, decalitre, decilitre, and centilitre are rarely used. Generally, only the terms litre and millilitre would be used. Again, get away from the confusion existing with too many prefixes as far as the consumer is concerned.

When you are speaking to a group of consumers, don't try to make it too technical. Bring it down to a point where they will be able to understand and be reassured that the change to the metric system will not be one that will cause vast confusion.

When we talk about change to metric, we call for an opportunity to review our whole program of weights and measures. When we go metric in weights and measures, do we want only a soft conversion or are we willing to engage in a little hard conversion ourselves. A change to the metric system will not only provide challenges to us, but will present opportunities to effectively improve and expand the role of weights and measures officials in measurement services.

MR. A. LADD (Akron, Ohio) : I would like to address this question to Mr. Shannon. Earlier today, when you were addressing this group, you mentioned a lot of statistics and cost factors relative to conversion in Canada, the cost of scale conversion to metric, and so forth. What is the scale industry doing insofar as getting technicians prepared for this?

MR. W. N. SHANNON (Berkel Incorporated) : Tony, in answering your question with regard to what the scale industry is doing, my comments should be taken as a general industry observation and, at the most, the Scale Manufacturers Association viewpoint. All the manufacturers are very definitely trying to fill their service organizations right now even without the thought of metric conversion because of the expanding industry and demand for scales and weighing equipment. In Canada, which gives us our closest reference because here in the United States we do not know the timetable for metric conversion, many of the companies which have a primary position in the Canadian area, such as Hobart, Toledo Scale, Fairbanks, Berkel, and others, are looking from an active standpoint. Once they understand what the practical timetable is, they can begin to acquire additional people and provide that type of training.

This is one of the problems that the scale industry is beginning to approach, recognizing that first we need to know when, how much, and what type of schedule. In Canada the postal scales as a plan could be approached first; and then a logical evolution would be to add on the retail scales used in supermarkets. Using that as a basis of discussion, it is important to have a plan where the scale manufacturers participate with the other industry sectors so that the resources of the industry are appropriately used.

We cannot take on the training of scale technicians and hold them in abeyance for possible conversion of an industry that may be four or five years out.

MR. LADD: Yes, but it is my understanding, based on many years of experience, that the scale industry today is in dire need of technicians as it stands. Are you people doing anything at all about training new people or seeking out new people?

MR. SHANNON: I can assure you that the scale industry is doing it because many of us find that we are competing for qualified people. So very definitely the scale industry is working to train more people; companies that I mentioned such as Fairbanks, Hobart, Toledo, Sanitary, Berkel, and others are really scrambling for people to get involved in the scale industry—to provide

them with training and to provide for the change in the industry, which is going from just straight mechanical to electromechanical and even electronic. Companies have on-going programs.

It is a massive investment in training and manpower. A good service technician who is capable of both retail scales, such as the automatic prepackaging scale and the electronic industrial scale, probably needs somewhere between six and nine months of eight-hour-a-day training over a relatively tight time period. So there is a significant investment for capable, qualified scale service.

MR. R. ROOF (Pennsylvania) : I would like to address this question to Ed Stadolnik of Massachusetts. Ed, one of the things that I have been holding my breath on in Pennsylvania is getting calls from laymen's groups, consumer groups, associations like these, to talk on the metric system. You stated in your speech that you had some speaking experience with the metric system before organizations. What approach do you think a weights and measures official should take when he goes to speak to one of these organizations?

We made slides of all the pages in the NBS publication "What About Metric?" What approach do you think you would take? Is your committee preparing any type, or planning to prepare any type, of prepared speech for distribution to weights and measures officials?

MR. E. H. STADOLNIK (Massachusetts) : In answer to your first question, I think in my talk I outlined a need for reassurance. I think that is one of the primary factors facing the general public.

Do not go into a presentation with a great deal of technical background. Go in with some sort of simple physical demonstration of what these particular volumes, masses, or lengths are; as outlined in some of the material that you get from the National Bureau of Standards. Have pictures of the quart versus the litre. I took several half-gallon containers and a quart container that I got from one of the milk companies. I just doctored one up for comparison to show the variation in size. In fact, there was not a great deal of variation in the sizes of the quart and the litre or the half-gallon and the two litre.

You could also use the comparison of a metre stick and a yardstick. There are other comparisons you could use relating to weight.

I would express to them that I would like to see a system where we would phase gradually into metric. This could create a situation where consumers would be dealing with a general supplementary marking system. Whether a supplementary marking

system will be voluntary or required, we do not know at this point. I think this would make it a great deal easier for consumers.

With regard to your second question, promotion of education, educational material for consumers is one of the work plans laid out by the Metric Planning Committee. We would hope to develop material that would be available for distribution on a regular basis to each weights and measures official.

MR. J. STEWART (Virginia) : I have a question for Mr. Evans. How much longer will the price per half-gallon be with us?

MR. A. EVANS (Veeder-Root Company) : I can only comment as a manufacturer of replacement equipment—the rebuilt computer and new computers. I certainly did not have someone in the audience ask that question intentionally; but I anticipated it and I have a prepared statement I would like to read.

Veeder-Root has tripled its production capacity over the past five months in the rebuilding and conversion of computers. We are now shipping greater than 10,000 rebuilds per month.

We are presently able to make normal deliveries (that is, in four to six weeks) of the 56 computer for both rebuilt and parts. The delivery on the old 36 computer—the number, incidentally, implies the year in which it was introduced—is presently eight to ten weeks due to the age of the product. However, our normal delivery of that will also be later this summer.

We are presently able to ship new four-wheel computers from stock for rebuilt or conversion of pumps or new pumps. We are not sure of the exact number of units in the field which have the 49.9 cents limitation. There have been some previous numbers as high as 200,000 units, and it may be more; but if I use the figure of 10,000 per month and shove that into 200,000, I get twenty months. If the figure is 100,000, it would only be ten months. That is about the way I can comment on it in terms of our capacity.

MR. W. H. MARKS (American Can Company) : I would like to refer back to the previous question. Will the educational and promotional material be available to industry as well as weights and measures?

MR. STADOLNIK: At this point I do not have a definitive answer for that, but I would think that it would be public information.

MR. E. YOUNG (Sun Oil Company) : This changeover is going to be confusing enough as it is without having different spellings for different units. Are we going to have a standard spelling for metre and litre, for instance?

MR. K. E. BAILEY (Williams Pipe Line Company) : Well, from the petroleum industry's viewpoint, the answer is yes. Publication

2564 sets it out very clearly as to the proper spelling and the proper usage of terms. We are supporting, as an industry, the SI (International System) and a consistent use of terminology within that system. The application, spelling, and abbreviations that are to be used are very definitely spelled out in that one publication.

MR. YOUNG: I do not happen to have that in my pocket right now. Could you say just what the spelling is going to be?

MR. BAILEY: If we use the "re" spelling, there would be no confusion. The unit of measure would not be confused with the instrument.

MR. YOUNG: That would be metre and litre in the "re" spelling?

MR. BAILEY: That is right. And, of course, litre as such is not a preferred SI unit, although we recognize that it will probably be used.

MR. YOUNG: How about the pronunciation of "ki' lometre" as against "kilom' etre"?

MR. BAILEY: "Ki'lometre" is the proper pronunciation.

MR. T. E. MORGAN (Huntsville, Alabama): I know that we are going metric, but I would like someone to tell me what the advantages are of going metric.

MR. STADOLNIK: One of the fundamental reasons, I think, is that we are an island unto ourselves and we are an industrial nation. We are a nation that is dealing more and more with the rest of the world. I think it is just a matter of keeping in step. There could be advantages such as cleaning up the number of standards that we have now. The English or customary system could be one of these types of factors. It gives an opportunity for everybody to review their standards.

I realize that this country has built a tremendous industrial complex. We lay claim to having the highest standard of living in the world, and we have done it with our customary system. I do not think that the use of that system has been a bar to us in attaining these goals. However, I think the time has come. I think we do see that over the long term the continued use of a type of measurement language or a measurement system that will be the only one of its type could prove to be more costly than if we take steps now to effect the change.

MR. EVANS: Yesterday the gentleman from Australia was pointing out some of the problems that are created for them by the United States not being metric. I am sure this is true for Canada also. This is a two-sided problem; it is a problem for us in dealing with countries that are metric and it is a problem for them in dealing with us.

MR. STADOLNIK: I got a call not too long ago from a paint company in Massachusetts who had to sell paint in terms of the litre when they were exporting to certain countries overseas. There was no way they could sell the paint in customary English gallons.

Not being metric does become a trade barrier. There are certain states that do have a great deal at stake in export products.

MR. H. F. WOLLIN (NBS): I think Mr. Morgan's question is a good one. I know we hear it all the time from many people—neighbors, friends at home. Just why are we going metric?

The National Bureau of Standards conducted a three-year study. As a result of that study, a series of reports was issued. The covering, or first, report was entitled "A Metric America—A Decision Whose Time Has Come." Probably the best way for you to prepare yourselves to answer the question as to why we are going metric is for you to get copies of that report. It explains the rationale for going metric. Then I think you will have a better appreciation and be better able to answer questions.

Upstairs, we have a display on metric. I believe you will see a copy of the publication "A Metric America—A Decision Whose Time Has Come" up there. I suggest you look at it. That is the best piece I think you could read that would help you to explain why we are going metric.

MR. K. J. SIMILA (Oregon): I would like to address this question to the gentleman from Veeder-Root. If a progressive retailer of petroleum products wished to anticipate the metric conversion and install these quick change gears on a four-wheel computer, are they presently in production or available? In round numbers, what would the cost be in quantity for modifying on the one to one ratio now that could be changed to the 3.8 to one, or whatever the ratio is?

MR. EVANS: We are anticipating that they will be available around the first of the year. Canada has a more imminent problem, and our immediate gear ratio tooling considerations are for their Imperial gallon to litre ratios. Around the first of the year, we would anticipate gear boxes would be available and easily adapted to four-wheel 101 computers. It is anticipated that the cost will be about $15.00.

MR. T. F. ROUTHIER (Fairbanks Weighing Division of Colt Industries): I would like to address this to Mr. Shannon. Of the hundreds of thousands of scales in Canada to be converted to metrication, how was it determined the percentage to be converted opposed to the replacement numbers?

MR. SHANNON: Rephrasing your question, if I may, how did the Task Force of the Metric Commission come up with this very

clear-cut set of statistics and guidelines? They are used because Canada has a National Weights and Measures activity with twenty-one districts. They had access to inspection reports, age of equipment, generally good cooperation on surveys from manufacturers and users, plus the competence of not only the director of Weights and Measures but of a scale industry engineer. I would call them educated guesses, but they are certainly within the realm of proper perspective.

They had ages of machines, the dispersion of population of the machines, type of use and expected longevity of them, so that they gave a tight area to work in as opposed to broad generalities. There has been an immense amount of work done by the Metric Task Force for the Metric Commission in Canada.

MR. ROUTHIER: Well, that seems to me to be more statistical data on scale population in Canada. I was wondering if there was a number one influencing phenomena, either the age of the scale or whatever, that would give them the numbers you came up with, which was a high percentage of scales, which would be converted as opposed to replaced with new?

MR. SHANNON: They had the benefit in addition to their own study of the other sector areas, including industrial areas, where there was contribution. I suggest to pursue this question further that the presentation of the entire Task Force Report of March be read to get the background information; and then there will be additional information from the Metric Commission. But the approach that they used seemed to be what I will call logical in coming up with some of these good, solid estimates, Tom.

MR. J. PILCH (Cleveland, Ohio): This is not a particular question, but it may evoke a general comment from the panel. We, as weights and measures officials, because Congress has not passed the metric system as being the system for the United States, are still going to have to deal with both. I think the comment was made that on many of the packages appearing in our stores now both are shown, both the metric weight and the customary weight.

I ran into one here just about two weeks ago. This was a consumer complaint that wanted me to order all the 32-ounce bottles of ketchup off the shelves in all the supermarkets of Cleveland. I asked on what basis. He said they show 32 ounces per bottle plus 907 grams; and as far as he knew from what he learned in school, there were 454 grams in 32 ounces.

Luckily, while sort of fighting for time, I had my secretary take out our conversion table. I found out that there are 453.5 plus grams in 16 ounces.

He was arguing about the one gram, and he insisted that there should be 908 grams in that bottle. He said maybe on the basis of one bottle, there is nothing happening; but for one gram in a million bottles of ketchup sold to consumers, the consumers are getting cheated.

So, this conversion sometimes becomes a thing that we have to take as a factor. Fortunately, after about fifteen minutes, I think I was able to convince the gentleman that what he was getting was correct. About two hours later, from another part of town, I got the same call on the same item. So it means that we may not want to deal in metric or the two systems at present; but I think we, as weights and measures officials, are going to find ourselves in the position of having to deal with it, whether we like it or not.

So, is there a general comment on that? I know that I am keeping my conversion table right on my desk in view so that if I get any more calls, I will at least appear to be intelligent.

MR. W. E. YOUNG (William E. Young and Company): Well, I think there are a lot of wags in this world, and all of the weights and measures officials are going to be inundated with comments like that. They are picayune things in many cases and I do not think most of them will be serious. However, you are going to have to field them. You are just stuck with this problem.

MR. STADOLNIK: I just might comment a little further on that. I think you are going to run into certain situations where packers will be coming out with supplementary declarations (both customary and metric) which are not forbidden either by the Fair Packaging and Labeling Act or by the model state laws and regulations. Of course, the statement must be correct. We had some communication from Pennsylvania not too long ago about a packer in Massachusetts who was not really aware of what the relationship was between 32 fluid ounces and the supplementary statement, which he had marked in grams. He had placed the responsibility for this type of labeling on the label manufacturer.

You have people in small shops, for example, who might be printing labels. They might be converting from an old metric chart; and they may not have that much expertise in metric.

This is truly a situation where there will be some confusion on the part of people in the printing industry, in the packing industry, and certainly among consumers. This is why we talk about the need for a rational, planned approach to metric conversion.

When you talk about the statement in terms of decimals—so many grams and fractions of a gram—where do you round off?

In effect, is it better not to round off so that when you have two terms you are not going to have the metric term actually a larger quantity than the customary term. Again, these are some real practical applications in making up appropriate, supplementary label statements.

MR. J. BIRD (New Jersey) : I would like to counterpoint something that Mr. Stadolnik attended to and that is the changing of laws and regulations in the state relating to the terminology—customary system and so forth. I believe that it may be appropriate for us, although we have a great deal of other work to do along with what we are doing here, if the research of state laws and regulations could determine, in fact, what we have that may have to be changed when we go to this program.

MR. STADOLNIK: In my presentation I did not go into an aspect of forming a state metric board or a state metric coordinator. I think checking out legal implications of all state laws and ordinances will be a tremendous job.

Proposed legislation, which was not passed this year, called for the formation of a National Metric Conversion Board. We would suggest that there would be coterminous with this type of a National Metric Conversion Board the setting up of state metric boards. One of the functions of these state metric boards would be to amend all state statutes which define measurement values in the customary terms. You are not going to throw them out altogether. You would have to deal rationally with each particular area of each statute. For example, when you are dealing with mileage terms, how are you going to go right into kilometres?

You will deal with a great many amendments to statutes and also regulations that are other than weights and measures regulations. There will be other areas, such as the State Purchasing Office, which will have a great deal to do with setting up certain types of contractual purchases. This will apply also to local purchasing boards and offices.

You will have functions that relate to the State Tax Department regarding tax statements based on customary terms, and the most common one is gasoline. You are taxed at so much per gallon. Now how will it affect the whole tax structure when you go to cents per litre or cents per cubic decimetre, or whatever term they may use.

You are going to get into Department of Public Works situations, which will require massive changes in signs, length measurements, road markers, and what have you.

It is not going to be merely the weights and measures administration looking over its own statutes, but it is going to have to

be a concerted effort on the part of all legislative and regulatory bodies to take a look at their own statutes and their own regulations.

MR. L. O. LEENERTS (Purex Corporation): This is directed to Mr. Young. Would it not be well for the packaging industry to use legitimate lobbying in the different halls of the legislature to get some guidelines for metrication? I was thinking primarily of a period of soft conversion. We have no guidelines now as to how far you are supposed to round off. One product that we have acquired was labeled differently in grams than we would have labeled it. It was rounded up, and it would be my tendency to round it down—just to keep from that confusion of the ketchup situation. Do you think the packaging industry could do some good by lobbying for legislation?

MR. YOUNG: I think that lobbying relative to legislation might not be the best way to do it. I think working with the National Bureau of Standards and their Weights and Measures Office might be a simpler and more effective procedure. These fellows know what you are talking about in the first place, and most of the legislators do not. Your weights and measures officials in the government, I think, will present packages to Congress and have Congress act on them. I do not think industry will advantageously deal directly with Congress.

MR. STADOLNIK: If you are going to do any lobbying, maybe you might lobby to have Congress make the commitment to the metric system rather than make any special laws at this particular time.

MR. YOUNG: I agree wholeheartedly with that.

MR. K. ALLEN (Hobart Corporation): The comment I have to make goes back to your ketchup discussion, and I just wonder if there is not more to that than meets the eye.

While we were talking, I heard somebody say fluid ounces. Then there was a statement that an ounce is 454.5 grams, or something like that. That is an ounce of weight, not a fluid ounce. If your ketchup bottle is in 32 fluid ounces, it can be any number of grams according to the specific gravity of the contents. So, if you are talking about this ketchup and saying an ounce is so many grams, let us think about what kind of an ounce that was. I think that was fluid ounce, and everybody missed that.

It might be a rather important comment. I think you fellows might be very much embarrassed if somebody called up and you made a firm statement that a fluid ounce was so many grams. That is not so.

MR. YOUNG: One great advantage of going metric will eliminate this confusion between fluid and weight ounces, because we will

be dealing with units that have different names. When we are talking of volume, we will have something that means volume; and when we are talking about weight, we will have something that means weight.

MR. STADOLNIK: I would still say that it would be an incorrect statement even though the weight was actually correct, because a supplementary statement should certainly deal in the same units as the required statement.

AFTERNOON SESSION—WEDNESDAY, JULY 10, 1974

No General Session Was Scheduled

MANUFACTURERS' EQUIPMENT DISPLAY

Photographs of some of the equipment displayed by manufacturers are shown.

MORNING SESSION—THURSDAY, JULY 11, 1974

(WILLIAM R. SEVIER, *Vice Chairman*, Presiding)

NET WEIGHT—POLICY AND PROCEDURE

Progress Towards Uniform Compliance Testing

by DR. CARROLL S. BRICKENKAMP, Office of Weights and Measures, National Bureau of Standards

Since I am first on the panel to address you this morning, I thought it would be important to provide you with some perspective on the general area of "Net Weight—Policy and Procedure."

The packaging industry, with one million workers, could be considered the largest industrial employer in the United States; it is certainly third largest in sales volume. Fully 75 percent of all finished goods (on a dollar basis) delivered to the consumer is packaged. The major package user is the food industry, with the cost of packaging in that industry ranging from less than 5 percent of the manufacturing cost of such items as bacon or frankfurters, through 24 percent of the cost of canned corn, to fully 50 percent of the cost of manufacturing fruit drink mixes.[1]

But packaging contributes to more than just our dollar economy—it makes possible an efficient system of mass physical distribution that preserves and protects products and is a convenience and a time-saving device. In short, it contributes a great deal to our way of life today.

There is a certain amount of buyer risk inherent in packaged products; he sometimes cannot see the product itself and certainly cannot attest at the time of purchase to its ingredients, quality, or quantity except by referral to the package label. To reduce this buyer's risk to some acceptable level, which I will not define at this point, someone has to control the package's quantity and quality.

The State and local weights and measures jurisdictions, the United States Department of Agriculture, the Food and Drug Administration, the Fair Trade Commission, and the producers of the packaged products themselves are all involved to a greater

[1] Milgrom, J. and Brody, A., *Packaging in Perspective*, Arthur D. Little, Inc., Cambridge, Massachusetts, 1974.

or lesser degree in this policing activity. Ideally, the various government and industry sectors complement each other; in fact, there are a number of serious discrepancies between the regulations and methodology of the government agencies, as well as a wide range of expertise apparent in the industrial sector in the area of package control.

Before I talk about the possibilities of remedying this situation, I feel my audience, the National Conference on Weights and Measures, deserves a progress report on the revision of NBS Handbook 67, the weights and measures manual for compliance testing of prepackaged commodities.

First, I think I should reassure you that there will not be that much which is unfamiliar to you. The manual will retain its straightforward, simple manner of giving step-by-step procedures, with many examples to demonstrate those procedures. We have nearly all of the procedures outlined, primarily gravimetric in approach, for the determination of quantity labeled by weight, liquid volume, count, linear or square measure, combination quantities, and such special problems as aerosol, viscous and paint products, drained weight, and frozen products.

Since this handbook is an operational guide for package control under the law, the method of control will continue to be based on the average concept as outlined in the Model State Packaging and Labeling Regulation; that is, the average of the actual package quantities in a lot, shipment or delivery, must be at least equal to the stated quantity; that there will exist, however, variations between the actual package contents and the label declaration. This concept, at least, is the common theme among all the government agencies and, indeed, international in its acceptance.

The protection to the buyer of packaged commodities which can be afforded by these laws, however, must be based on the practical necessities of compliance inspection. It is usually impossible to test or inspect the entire lot, shipment, or delivery. So we select a few items out of a lot by a sampling procedure that insures that our sample reflects the lot from which it was taken.

In most instances, definition of the lot for a standard pack item is fairly straightforward. We would, in general, look for the manufacturer's code when it is available. Therefore, we suggest that when the place of inspection is the retail store or wholesale warehouse, a lot would consist of all packages with identical labels and, where possible, with the same manufacturer's lot symbol or code number. When the place of inspection is the packing plant, a lot would consist of packages with identical labels and manu-

facturer's code number and would not exceed some unit of time, say an hour's production, from one production run.

For random packs, however, we would suggest the definition of the lot at the packing plant or central meat processing plant to be all packages of one type or style of product produced at one establishment on a particular day, bearing identical labels, and available for inspection at one time. When the manufacturer's code number or lot symbol is available, these would be used to delineate the random pack lot. When inspection is at the retail store, a lot would consist of all the packages of a particular department on the same day available for inspection at one time. Conceivably, this could mean that most of a meat counter, say, in a supermarket, would be the lot. Why would we do this? Because in many instances we have reduced the variables sufficiently by this definition—we have limited the lot to the same packager, the same device, and the same method of tare determination by the packager.

The variables are the physical characteristics of the product, the tare, and the interrelationship between the two. There may be too many variables; but some weights and measures jurisdictions have used this definition of the lot before, and have found it time saving and fair. Again, I want to add that we will have to experiment with this definition and hear your reaction to it. Perhaps after you have tried it with the many if's, but's, and when's that the actual procedure would have written into it, you will find your job of inspecting random packs considerably easier.

In order to make a decision on the lot, we must choose a sample to be representative; it should be a "random" sample. This will be a little different, since your long standing practice of picking carefully from the top, bottom, left side, right side, front, back, and center is not strictly a random sample. If I might explain, any time there is a pattern to the choice of a sample, that is precisely when the sample is nonrandom. What I have described to you as the old handbook's method has a certain, if vague, pattern to it. In order to use this sample to make a judgment about the lot, you need to know what is a good lot; that is, what is acceptable for selling. Our Model Regulation defines this partly with the average concept; but for any process which is subject to variations, we have to know what those variations are to see if any buyer is getting too little when some other buyer is getting too much. But what is too little or too much?

Eric Vadelund reported to you last year that we were planning a collection of data from all types of commodities which would define what reasonable variations are. We would have to amend

or update this as packagers get better at package control themselves. I think you can imagine the enormity of such a proposal. In the interest of getting this document out to you to field test, I would like to suggest to you that we begin with an arbitrary definition of equity ranging, say, from ½ to 5 percent variation allowed from the average which, as before, would at least have to equal the labeled weight. This variation, which I propose, would depend upon the product's physical and chemical properties, the process control, the package material's properties, the size of the package, and the inspection situation in the marketplace, from in-plant to retail.

If exceptions are necessary, we will have to define the criteria for these exceptions so that as new products come into the market, you, as weights and measures officials, will have guidelines as to how to deal effectively with them. Presently, we need evidence for the quantitative definition of product variations. As I said, I know the analysis of this data will be lengthy, but I would like to enlist your help now to provide us with data—up-to-date data—of the type such as quality control charts or weights and measures, industry, and federal agencies as well.

As an aside, you can see that the standardization of report forms would be an important objective to us in this scheme. We would need this standardization in an ongoing data collection for review of commodity variations. In effect, we expect these variations to be variable.

Admittedly, there are policy questions which still have to be resolved. For example, there is the definition and measurement of tare, whether wet, dry, or, as some are wont to call it, "real.' We know that in these days of material shortages, there is presently no hope of providing you with, or giving you a procedure which would, in effect, define a few standard tares. Tare will have to be measured every time. We have been looking, however, at commodity types which represent special problems in tare such as: (a) toothpaste, because of the difficulty of complete delivery; and (b) bacon and milk, due to their exposure problems. This might require estimates of tare based on the variability of packing materials with respect to the variability of the product inside. This could be original research; I hope not. If any of you listening to me today have data on this or similar items, I hope you will get in touch with me either here or on a confidential basis at the Office of Weights and Measures.

As you can see, we have the skeleton and some flesh, or muscle, if you will, on the body of the handbook. We are waiting to hear from you, especially from weights and measures, since this handbook is for your use.

I think it is appropriate that I introduce the authors of this document-to-be. Of course, the entire Office of Weights and Measures has provided input, especially Mr. Harold F. Wollin, Chief of OWM; Mr. Stephen Hasko, who, as you know, has worked on the procedures for problem packages in some depth; Mrs. Mary Natrella from the Statistical Engineering Laboratory at NBS, our statistician in this effort; and Dr. Joan Rosenblatt, Chief of the Statistical Engineering Laboratory.

Now, what about uniform compliance testing; where is it today? It was reported last year that NBS, FDA, and USDA were meeting. There were two problems, as I see it. First, there were changes in personnel both at FDA and NBS. More importantly, as far as I can determine, our group had no clear objectives. We just exchanged information as to where we were. Right after the Conference we intend to meet again—a planning session—to spell out those specific policy and procedural elements which we can and must address.

Let us look at some differences which are apparent today. When FDA says full net weight, they mean a sample which averages 99 percent or greater of the labeled weight. Compare this with NBS Handbook 67, New Jersey's Article 13, California's Article 5, or New York or Wisconsin's methods. USDA and FDA both check mainly at production point; traditionally, weights and measures have concentrated on the retail level. But I hasten to add, this situation is changing—methods for package checking in the plant were requested by two regional associations at the interim meetings of the NCWM last January.

Our differences are vast becauses our priorities are different. Health and cleanliness are, and should be, higher concerns to FDA and USDA than net weight and net quantity. I realize, as Mr. Wolski will probably point out again this morning, that we are driving industry crazy with the array of different regulations. On the whole, the consumer takes full net quantity for granted, precisely because the weights and measures guarantee, as it were, of buyer-seller equity has been managed so well by the states; and because weights and measures assurance is so basic a right as to have been written into our Nation's Constitution and, indeed, dates back to the Magna Carta.

Before closing, I would like to add a particular concern of mine which we should all examine: Is it reasonable that the producer's and packager's responsibilities for full net quantity be limited to certain levels in the marketplace transaction and not extended to the retail consumer level? This question, if answered positively, might make possible, I think, a subtle form of discrimination of packagers who package at the retail level, as well as further

deviation from accurate labeling at retail as to the quantity contained in a package. This question is being asked; we, all of us here, must try to answer it.

In conclusion, I want to say that we do not, any of us who would be working towards a uniform compliance program, plan to make documents such as the Meat and Poultry Inspection Manual of APHIS, or the FDA Inspector Programs Manual, or NBS Handbook 67, for instance, into one book for all the agencies use. We would hope, I think, to extend the similarity of concepts upon which they are based, but still aim at responding to the needs of their various users. My job is to revise NBS Handbook 67 for you, weights and measures officials.

NET WEIGHT—POLICY AND PROCEDURE

USDA Net Weight Philosophy and Procedures

Presented by IRWIN FRIED, Chief Staff Officer, Systems Development and Sanitation Staff, Technical Services, APHIS Meat and Poultry Inspection Program, U.S. Department of Agriculture

I would like to present some of the machinations that we in APHIS, or at least the APHIS part of USDA, have gone through during the past year and share with you some of our experiences, some of our findings, and where we are at the present time.

There was a certain case in California that caused widespread publicity where shortages were found in bacon. There were suits and countersuits. After the judge in the case had made his original decision, we came away with one very firm understanding insofar as we at APHIS were concerned. That is the fact that under the terms of the Federal Meat and Poultry Acts, the states are definitely prohibited from taking action against Federally inspected product in any field unless, and this is the big unless, they use standards and procedures which are the same as those by which the product was judged originally.

Now this is a very important point. It is spelled out in our law, but it has caused a lot of controversy. It also pointed out something else to us. The judge in the case refused to allow the procedures which we in Meat and Poultry Inspection had been using for many years. He refused to allow those procedures to

be entered into the legal proceeding. The reason why he did this was that the procedures themselves were not contained in our law or in our regulations but were in our inspector's instructions, which had no legal basis.

What did this mean? It meant that states which had concurrent jurisdiction over Federal product, as long as they used the same standards and procedures, in effect, could not exert that concurrent jurisdiction because of the fact that there were no procedures in the regulations.

We had entered into discussions with the National Bureau of Standards, the Food and Drug Administration, and with other parts of USDA, notably AMA, who were interested in the net weight area. Although we had entered into discussion with them toward finding one, or as close to one as we could get, standard procedure for everyone, we felt that we could not wait for the complete fruition of that before coming out with a regulation of our own so that states could continue to check Federally inspected product.

As a result, we published a proposal in December of 1973 for comment. The comment period was supposed to expire in March, I believe. The volume of comments and requests for additional time to supply data was such that we extended the comment period to May 31. We are now in the process of digesting those comments.

There were so many misunderstandings and so many requests for changes on both sides of almost every problem that had to be solved that we have decided to come out with a revised proposal for comment instead of going into final rule making. Hopefully, this will be in the Federal Register for your review in the near future.

I have divided my presentation into a couple of different areas. I call number one the problem areas on reexamination for compliance, because I think the reexamination aspect is of more interest to you than is the original examination.

In APHIS we have a rather unique position as far as regulatory agencies are concerned in that we have inspectors stationed at every plant that is under Federal inspection. We have input on the contents of packages before they ever leave the plant. The problem areas that come up when a reexamination or an examination is made for compliance at the retail level are slightly different. What are some of these problem areas? Getting back to the point of production, to begin with, a particular lot might not have been in compliance when it left the plant. I would be the very first to admit this. There are going to be times when

the product is not right and should not have been allowed into commerce. So that is problem number one.

Another problem is the fact that the procedure used to judge the product originally is now different when applied at the retail level. In other words, we are now talking about a lot that would be in compliance by anyone's standards but because a different system was used to judge the compliance at some other point, the lot would be found out of compliance. One of these differences might be different sample sizes used at different points of inspection.

The next problem is products that change weight. At the production point the products meet the requirements; but as they proceed into commerce, the weight changes. Usually we are concerned with the fact that the change that takes place is a loss in weight. In dealing with live tissue, tissues that contain a great deal of moisture may shrink. If the packaging is not hermetically sealed, there is a good chance that moisture evaporation will take place. That package, when judged at some future point, will weigh less than what it did originally.

There is a change of weight that is due to loss of moisture but not necessarily evaporation. The weight change might actually be leakage away from the product as moisture or leakage contained in the package (or it might not be contained in the package); but if we are going to judge the product itself, there has been a change in weight. This ties in with a problem I define as a difference in definition. The lot was okay originally. The evaporation that took place is now considered unacceptable. Perhaps the original law or regulation under which it was judged said that a reasonable loss of moisture is acceptable. So there is a difference here in definition as to what is acceptable.

Again, is loss of fluid by actual leakage, whether these are contained in the package, absorbed in the package, or lost through the package, acceptable or unacceptable? Differences in definition cause problems in judging compliance at two different points.

Then we have to discuss the problems of sampling. We do know that in taking any sample of a product there are certain probabilities of judging the actual condition of the lot correctly, and there are other probabilities of making an incorrect decision. So now we have a case where the product originally might have been in compliance but because of sampling differences or because of drawing a different size sample, we might find that the product, although it was correct, was now judged unacceptable.

Well, those are the problems. What do we do about problem solving? I have tried to condense the needs of all of us. When I say all of us, I am talking about regulatory agencies, officials

who judge compliance, producers who have to know what they should do in order to meet the requirements, and the consumers and what the consumers expect to receive.

First on my list of priorities is the need for a definition of net weight. To me this is one of the biggest failures that we have. For years we have been talking about net weight; yet in reality we do not have an exact definition of net weight. Now why do I say this? Shrink is a very good example. Is net weight the net weight of a product immediately when it is put into a container or is it the net weight at whatever future point it may be judged, be that three weeks, three months, six months, or a year later? At what point is the net weight the net weight? We must decide and define.

We rarely, if ever, judge net weight by actually weighing the product. In most instances, we take a gross weight of a package and its container and determine the net weight by subtracting a tare weight. Therefore, the definition of a tare weight becomes very important in defining net weight. Some of the problems that we have been encountering during the past year are in defining dry tare, defining the products on which a dry tare is to be used, defining wet tares, and defining when a wet tare is to be used. These are very important considerations.

In addition, the actual determination in any lot of product of what that tare weight should be will depend upon an even smaller sample of packaging material than we usually use for determining the net weight of the lot.

So, again, we have problems because of variations in the weights of the containers and packaging material that effect our tare weight which could effect our recording of what the net weight might be.

Last, but certainly not least in this day and age, is the question of drained weight. Speaking for Meat and Poultry Inspection, we thought that we were quite a bit ahead of the game in that in many instances we defined the net weight of certain products as being the drained weight. We did this because we felt that the product itself, the particular piece of meat or poultry, was really the only thing being sold in that container. This was true, especially when things such as water and brine were being used to fill a container so that it could be properly processed. On the other hand we had a definition that in products of this type, the net weight of the container was the total net weight. This would be true where the liquid that was added to the container was nutritious. This is a definition that, if kept in the revised proposal, will certainly need further definition because of the volume of

comments we had concerning the puzzlement about what constituted nutritious and nonnutritious.

To summarize what our proposal said as far as defining net weight is concerned, the first problem that I spoke about was moisture loss or shrink. In our proposal we removed this allowance. We removed it by saying nothing about it, which meant that the net weight would be the weight of the package as found upon examination at any point.

As far as tare weights were concerned, we, for the first time, introduced the concept of using a wet tare. We defined the wet and the dry tare usage as follows:

> "If the container itself was impervious to moisture absorption, and if the product itself was a legal product when it went into the container, then everything recoverable from that container was part of the net weight."

In effect those were the products that would have a dry tare.

If the product had a tendency to weep or to lose moisture because of its nature and it was absorbed by the packaging material so that the product was not recoverable by the consumer, then that absorbed moisture was included with the weight of the packaging material, was included with the tare weight and, therefore, was reduced from the actual net weight. (Most meat and poultry products are in this category.)

So we actually defined the tares to be used by the type of materials that were used in packaging. Anything absorbed by the package, and therefore lost to the consumer, was part of the tare weight. This is the wet tare concept.

When a product is placed in a container and then liquid packing material is added, we have always used the drained weight as the net weight statement when that added liquid was water or ice—nonnutritious. If the added liquid was broth or sauce, we counted it as part of the net weight.

The next problem that needs solving is a standardized procedure for determining compliance. As part of the procedure, we almost invariably prescribe a sample selection that is used to represent the lot; and the sample size needs definition. It must be practical and, at the same time, must give the degree of confidence in the result that we need.

We must make a decision as to whether to continue to use the average concept versus no individual package in a lot being below the stated weight. This is a very difficult decision to make insofar as many consumers are concerned who feel very definitely that no package they receive should ever be below.

These are the problems. Shall we use the average of the sample

or shall we introduce a procedure that says no package shall be less? Problems with the average are that a consumer, in buying a package, will occasionally receive a package that does not contain the full stated net weight.

The problem with no low individual is the amount of overpack that would be necessary in order to meet no individual package in a production lot being below a stated minimum. Certainly a gross overpack is needed and this will show up in the cost. Suppose you are willing to pay this cost? There is another problem involved—the inspection system. Inspection for compliance of no low weights in the lot is almost impossible. The sample size needed would be so large that it would be totally impractical. To really assure no low weight, you would have to look at 100 percent of the packages.

If we stick with the average concept, shall we just say the average of the sample or shall we put a limit on how any individual product, any individual sample unit, may go? I think we would all agree that if we are going to use the average concept, we should have a limit as to what would be unreasonably low and unacceptable to the consumer even though the average of the lot was acceptable. We have got to find a way of determining what those reasonable shortages are and write them into our procedures.

This is going to be a long study; it is going to be a continuing process. We need as much input as we can get. We have got to really put as much of our available statistical manpower into the studies as possible. We cannot arbitrarily say one-half of one percent is unreasonable. We cannot arbitrarily say that 5 percent is unreasonable. We need actual studies that say for this particular product or for this category of products, in these particular container sizes, this amount would represent an unreasonable shortage and most of industry should be able to meet the requirements.

Under the uniform procedure, we must determine the average tare that we are going to use in determining compliance. We must have a tare weight procedure that can get the job done.

I would like to summarize for you under this procedure how our proposal stated that these problems should be handled. In our proposal, we suggested that the procedure used to determine compliance would determine the net weights of the individual packages in the sample and that the average of the sample would be one factor in determining compliance. The average would have to meet the stated label weight. We put a limit in the proposal, we divided products into six different categories, and we defined unreasonable shortages for each of those categories. The categories were determined on the basis of product type and the size

of the package. We suggested a sampling plan of 10 to be used for small lots of 250 packages or less and a sample size of 30 for larger size lots. We have been advised that in many instances some lots contain less than 10 packages, so we are very definitely going to have to do something about that sample size of 10.

In summary, we are in the process of digesting close to 2,000 comments received; we are making some decisions as to changes to be made in the proposal. Hopefully, they will be made soon and will be out again in the Federal Register for comment. We would like to continue our dialogue with the entire population insofar as input. We pray that the input given is as meaningful as it possibly can be. The statement, "We do not like this" is fine. It is a very definite expression; but we must know what you do like. If we can get actual supportive data for changes, that is something we can evaluate in coming to a final rule making.

In closing I would like to confirm the fact that we are very happy that we have, in fact, agreed upon a forward-going group of government regulatory and nonregulatory agencies concerned with net weights. Hopefully, we will make some of these decisions that have to be made quickly so that we can reach our ultimate goal of having everyone—producer, consumer, enforcement agencies—working with one uniform concept of net content measurement.

NET WEIGHT—POLICY AND PROCEDURE

The Case for State and Local Enforcement

Presented by HERBERT COHEN, Administrative Adviser,
Department of Food and Agriculture, State of California

We are in a period of transition in weights and measures law which is unlike that which has ever existed within America. We are moving from a period when you, as the state, county, and city officials, had primary responsibility for enforcement of weights and measures law into a period where federal agencies are taking over that responsibility and you have a somewhat subordinated role.

The larger issue before us is to what extent the states are going to maintain their place in the weights and measures system for the protection of their industries and

their consumers. I stress wholesalers and retailers as well as consumers because they certainly need the protection that you have been giving them.

We are dealing immediately with the Federal Meat Inspection Act and the Federal Poultry and Poultry Inspection Acts; but, actually, we are dealing with more. We are dealing with the Food, Drug, and Cosmetic Act, the Alcoholic Beverage Control Act, the Seed Law and, finally, the Fair Packaging and Labeling Act.

When we put this package of federal legislation together, there is virtually no packaging that requires your services that is not covered within this array of federal legislation. The pattern which is developed by USDA is very likely to set the pattern for the entire United States packaging industry and package checking programs. Thus, I say that we are in a transition era. It behooves us, indeed, to look very carefully and to move somewhat more slowly than Mr. Fried has suggested.

I appreciate the desire of USDA to get on with its work of producing practical, workable regulations. Indeed, I commend USDA for getting to the job. However, there is a considerable amount of dispute as to what these regulations would propose in practice, how they would actually operate at the local level.

Our statisticians and USDA statisticians talk a similar technical language, but they do not arrive at the same conclusions in many cases. Certainly, our lawyers and the federal lawyers do not arrive at the same conclusions; that is not so unusual. But when the statisticians do not agree, then I do have a little more concern.

If I would have any one overall message in my speech today, it is that you, as state, county, and local weights and measures officials, need to consult with USDA, and USDA needs to consult with you to go over in detail the operation of these proposed regulations. What happens in the next six months, or perhaps even three months, is going to set a pattern which may last for 100 years.

Let me go back to the beginning of this new era. The controversy arose in California where we have Joseph Jones, Director of Weights and Measures for Riverside County, and Maynard Becker, Director of Weights and Measures for Los Angeles County, taking action against Rath Packing Company for short weight.

The Jones case resulted in action in the Riverside County Superior Court and an injunction against Rath. The Becker case went to the Los Angeles County Superior Court. Rath then

brought a cross complaint in the Federal Court in Los Angeles. The Attorney General went into Federal Court and said we have state prosecutions here under state law. The defendants are going to Federal Court to try and get out of the state prosecutions. Let them come back and argue their defenses in State Court. The U.S. District Court said fine. You go back and you defend yourselves in the State Courts. Nothing is going to happen to you in those State Courts that should not.

Rath then filed additional actions on their own in Federal Court asking for injunctions against the State action. In the first case it was removal, in the second case it was a request for injunction.

The cases went on to trial and United States District Judge Manuel L. Real decided that he would take jurisdiction of the case, notwithstanding the fact that the cases were already pending in State Courts and, in fact, an injunction had been issued against Rath in State Court. He wrote a decision in the case of The Rath Packing Company versus Becker and Christensen, Director of Agriculture of the State of California, and The Rath Packing Company versus Jones, which will become a landmark in the law of weights and measures.

Basically, Judge Real held that under the Meat Inspection Act the law was designed to improve the position of consumers to give them more knowledge and more protection; that the Secretary of Agriculture had a responsibility for the labeling, which included net weight labeling, of meat food packages not only at the plant level but also at the retail level so that, in effect, the labeling would continue all the way down the commercial channel; and that the states, while they had concurrent jurisdiction as the law provided, had concurrent jurisdiction to enforce the federal standard.

The State of California argued something like this. The concurrent jurisdiction is for USDA to say what label shall be put on the product at the plant level. We do not say you have to put any label on at all, Mr. Packer, but when it gets distributed in our state or in a county or city, then that label must be accurate under state law.

Judge Real said that the Secretary of Agriculture's guidelines were to produce regulations under the law which allowed so-called reasonable variations but that the Secretary of Agriculture had failed to define what these reasonable variations were. No inspector could be given the keys to the jailhouse, as it were, to determine what was reasonable and, therefore, the federal regulations were invalid. However, he went on to say that the states were not left helpless; and here I guess we have an ideological difference

with USDA. Judge Real made a sweeping statement that consumers were meant to be protected by this legislation and that federal law, therefore, left the states a remedy. We could not have a sampling plan which was different from USDA's sampling plan—and USDA just did not have a sampling plan—but we could take packages off sale on a one-for-one basis.

The Secretary of Agriculture has not defined what reasonable variations are, therefore, the standard of the act is accuracy; and any package which is not accurate as to weight labeling, the state could take off sale. We, in California, adopted regulations to do just that.

Now with that bit of background, let me read you from Judge Reals' decision.

> It is clear in the provisions for concurrent jurisdiction outside an inspected plant that such actions as are undertaken by states in the regulation of meat and meat food products must be *consistent* with the requirements of the federal Wholesome Meat Act of 1967. That Act has spoken upon the subject of misbranding—and more particularly when misbranding is related to comparison of the label with contents as provided in 21 U.S.C. § 601(n)(5) in this language:
>
> "(n) The term 'misbranded' shall apply to any . . . meat or meat food product. . .
> * * *
> (5) If in a package or other container it bears a label showing . . . (B) an accurate statement of quantity . . . in terms of weight . . .. Provided that under Clause (B), reasonable variations may be permitted . . . by regulations prescribed by the Secretary."
>
> To implement subsection (5), the United States Secretary of Agriculture published rules and regulations in Title 9, Code of Federal Regulations. In section 317.2(h)(2) the Secretary provides:
>
> "(2) The statement as it is shown on a label shall not be false or misleading and shall express an accurate statement of the quantity of contents of the container exclusive of wrappers and packing substances. Reasonable variations caused by loss or gain of moisture during the course of good distribution practices or by unavoidable deviations in good manufacturing practice will be recognized. Variations from stated quantity of contents shall not be unreasonably large."

And then Judge Real comments upon these regulations of the Secretary and how the California law applies. He says:

> California Article 5 (That is our sampling plan.) just does not meet this Federal standard. Nowhere in the measuring processes set forth therein in detail is any consideration given to the possible "loss . . . of moisture during the course of good distribution practice." The measure of Article 5 is "absolute" as determined by accepted statistical methods and, as such,

erroneously encroaches upon the standards provided by the Federal Wholesome Meat Act of 1967.

Defendants argue, however, that section 317.2(h)(2) is void for vagueness; that, therefore, we are left with the absolute standard, "an accurate statement of . . . weight." Though valid, this argument does not end the inquiry in favor of state action. California Article 5—though measuring the absolute provided in California Business and Professions Code section 12211—applies a statistical "averaging" concept for the sealer to make the final determination of whether or not packages in violation should be ordered "off-sale." The Federal Wholesome Meat Act of 1967 does not give state legislatures or state officers—even in the grant of concurrent enforcement jurisdiction—the right to substitute their judgment of what variances, either plus or minus, come within the absolute standard of "an accurate statement of . . . in terms of weight."

Let me interject here that you will notice that Judge Real states that the term "variances" in distribution practice, manufacturing practice, and so on, applies both to overages and underages and does not mean tolerances. It does not mean any minus standard at all.

Following the adoption of our new regulations in California, in which we gave our directors of weights and measures in the counties authority to take off sale packages on a one-for-one basis, we had further action by Mr. Jones. There was a response by three flour manufacturers in a related case called General Mills, The Pillsbury Company, and Seaboard Allied Milling Corporation versus Jones, which again went before Judge Real.

Mr. Jones is represented by Loyal E. Keir, County Counsel Deputy in the Office of the County Counsel of Riverside County. Mr. Keir has had primary responsibility in this case, with some assistance from the Attorney General. Judge Real said the same general proposition applied in the General Mills case as in the Rath case except that here it was the Food and Drug Administration. They provide for reasonable variations but they do not say what the reasonable variations are. No inspector can decide what these reasonable variations are; therefore, the standard of reasonable variations is void. What is left is a requirement of accuracy. The State of California then adopted further regulations as to flour saying (as to these products) we will take them off sale on a package-by-package basis.

So, it is not really accurate to say that Judge Real told the State of California, or any of you, to go away and leave these products alone. Judge Real did say that the federal agencies had not done the job Congress required them to do. The federal agencies were giving their inspectors so much discretion that there was no way that the packager could know what was legal and what was not. In fact, this much discretion amounted to no

enforcement at all because if the packager did not know, how could you hold him really responsible?

Judge Real went on to say that the states still have this concurrent jurisdiction, the fereral standard of accuracy remains, and the states can take these packages off sale on an individual basis.

The next question will be what happens under the proposed regulations which will be adopted by USDA. I am really very proud and delighted that USDA, as I said, did get busy. They recognized their responsibility. We have a great many differences of opinion as to what their regulations say. Many of you apparently share these problems because of the large number of responses that Mr. Fried has commented upon.

In the flour case the response of the Food and Drug Administration was completely different. Carroll Brickenkamp commented that FDA is an organization beset with many problems, and perhaps weights and measures is not at the top of their list of priorities. I could only concur. She mentioned their annual dry tare program and the fact that they found in this program 93 percent of their products were full weight because they defined full weight as not being more than 1 percent underweight. While they found something like 15 percent of all the products that they sampled were underweight, and something like 12,000 or 14,000 packages were samples, they managed to make one seizure throughout the United States as a result of this nationwide survey.

You can understand that with this approach (drug safety, for example, is a lot more important than minute differences in the amount of flour) USDA inspectors would take a somewhat similar attitude. In fact, we might say that if you looked through the Food, Drug and Cosmetic Law Reporter under the sections of misbranding and adulterations you would find that the Food and Drug Administration has been comparatively active in bringing cases involving mislabeling of drugs when they did not contain the right ingredients or when deleterious materials had been added.

But you are not going to find very many cases dealing with short weight product at all. In fact, the lawyers in this case are arguing over the most important case in the field, and probably the only one which we are able to cite, called Shreveport Grain Company, which was decided in 1932. The argument is over how important this last case was (this precedent in 1974) and what it meant anyway. The courts cannnot seem to decide what Shreveport Grain meant.

Let's get back to what FDA did. FDA went to the Attorney General of the United States and filed an amicus brief in which they said there is nothing wrong with our reasonable variation regulation. It is a perfectly valid regulation and, in effect, all of this is a little picayune.

Perhaps I could read to you a small portion of their approach because I think the brief speaks for itself better than any comments that I could make. We are talking about flour. USDA says through the Attorney General:

> In the case of flour strict adherence to the letter of the statute produces a useless result that is wholly inconsistent with the intent of the statute.
>
> In the case of packaging and labeling flour an unthinking insistence on accurate labeling of weight at the time of retail sale does not necessarily best serve the needs of consumers. If moisture content is not considered, the stated weight may be extremely deceptive. The present regulation carries out the statute's purpose and should be upheld.
>
> To avoid inconsistency with federal law and policy state enforcement policy must therefore support the federal requirement of accurate labeling. A state policy of prosecuting short weight packages, no matter how little the actual weight is less than the stated weight, would be inconsistent with federal law and policy and would be barred by the supremacy clause.
>
> The reference to good manufacturing practice indicates that packages are permitted to use ordinary commercial equipment. Unavoidable is an explicit term and creates no doubt. The provision for variations caused by gain or loss of moisture during the course of good distribution practice is equally explicit. Requirement for good distribution practice is parallel to the requirement for good manufacturing practice and leaves no doubt to the manufacturer of his obligations under the law.
>
> In respect to variations arising from the packaging process the officer (that is the enforcement officer) must exercise some judgment but not on what variation is reasonable. Instead, the judgment made is to what deviations are unavoidable.
>
> That judgment requires understanding of the capabilities of commercial packaging machinery and the only source of difference in judgment among enforcement officers would be a difference of opinion on what their capabilities were. That possibility is hardly the unbridled discretion a lower court asserts exists under the regulations.

The Food and Drug Administration simply takes the view that they want to continue the way they were.

I apologize if I have misquoted the brief or if I have given undue emphasis to certain parts. The brief itself runs 21 pages, and you can read it if you wish. I think you get the flavor at least as we interpreted it.

When a government agency takes a position, it takes the position for both sides of the queston. The result is that at present the State of California has an injunction against the Rath Pack-

ing Company for short weight of packages. The Rath people did get an injunction for a little while against the State in Los Angeles County, but that was voided by an appellate court. In Judge Real's case, Judge Real says the State can continue to mark packages off sale and should do so when they are short weight, whether in flour, meat, or any other product.

The cases are now pending before the Ninth Circuit Court of Appeals in Los Angeles. They may be heard sometime within the next two years. We have asked the court to try and speed this up because of the enormous public interest. We are hopeful these cases will be consolidated and maybe they will be heard in six months.

Now, I have mentioned the role of USDA. They got busy and they did something. We disagree somewhat with what they did but we want to talk with USDA about that.

I have mentioned the role of FDA. They do not want to change apparently. And, finally, there is the Federal Trade Commission. They are, as far as we are able to determine, an unknown quantity. Unlike USDA and the Food and Drug Administration, they have never taken any position opposed to state action. Indeed, when these suits were first filed, we went to USDA and asked them to come in and support us. The Wholesome Meat Act was meant to protect citizens and wholesalers and retailers. They said that for reasons that are best known within their organization, they were not going to get involved in this lawsuit. Personally, we regret that because when you are in a federal court and the federal agency does not give you any support, your position is not as strong as it would otherwise be.

We asked the Food and Drug Administration for support. They said, in effect, that they were really not quite in agreement with what California is doing.

Even before this began, FTC adopted a regulation which you will find in 16 Code of Federal Regulations Part 500, which comes under the Fair Packaging and Labeling Act. They have the same type of language in their statute, all of which started with the Food, Drug, and Cosmetic Act. Their language parallels a great deal of what the model law is talking about. After talking about reasonable variations they said, "provided that such variations shall not be permitted to such extent that the average of the quantity in the packages comprise a shipment or other delivery of the commodity below the quantity stated and no unreasonable shortages in any package will be permitted."

If USDA and FDA has taken the same approach as FTC did independently sometime ago (this was adopted June 27, 1967), this whole thing might have been wound up with the packing

companies agreeing to stop this litigation and talk about adopting regulations. We would still need to adopt regulations, but we would not need to spend these thousands and thousands of dollars and manhours on this litigation.

As to the USDA regulation, what have we been objecting to? I think you are familiar with it. First, we said that the Rath people come into court and say the only enforcement is through the federal agencies. We said the regulation is absent on this subject. Therefore, we cannot be sure that USDA really intends the states, counties, and cities to really have an active part.

USDA people have indicated that USDA does not intend to do away with the local jurisdictions having enforcement power. Exactly to what extent, we are still not sure. That is one of the things that we must talk with USDA about before the new federal regulation proposal is put out.

There was a weight range proposal I think most of you are familiar with. We do not know what USDA intends to do with it. We had all sorts of dry tare problems. We are afraid that there are lots of cases where consumers will still be paying for cardboard that is saturated with what USDA calls nutritive fluid as part of the net weight. Basically, if a packer is allowed to pump fluid into the bird or the piece of meat and it weeps out into the cardboard, we do not care if it is called nutritive fluid or anything else. The consumers cannot use that cardboard for anything, and we do not think they should have to pay for it as part of the net weight.

We think that the regulations, for example, should prescribe a certain overpack requirement at the packing house level because we do not see any way in which it is possible to have net weight on the average at the packing house level and still have net weight on the average of lots at the wholesale and retail levels.

USDA has another problem. Federal budgets are tight just the way your budgets are tight; and there are not enough inspectors to go around. These inspectors are not always equipped to check the scales of the packer and they may be accepting the packer's scales. This is another general area that we need to talk with USDA about, in terms of whether or not the local sealer, for example, will be able to go in and look at the scale the packer is using to see if it is actually running accurately. We have heard reports of USDA people saying, "You stay out of USDA plants. You take on faith that we have checked everything all right."

You see, when the law talks about concurrent enforcement jurisdiction, somehow we think that word "concurrent" has a lot of meaning. We need to talk with USDA about what that concurrent means. If concurrent means only that after USDA says to

do it a certain way, we have authority to go in and say after we have done it that old way we still find it short. Then we go back to the USDA compliance officer and say, "Do something."

That kind of concurrent jurisdiction is what any housewife can do when she takes home a package of bacon, weighs it, finds it is short, goes running back to USDA, and says, "Do something."

We think concurrent jurisdiction was meant by Congress to mean a great deal more. Judge Real's stress on the fact that the purpose of the law is to protect consumers convinces us that what we think is right.

The purpose of this law was to further protect consumers. The USDA certainly acknowledged this. There is an interesting statement by the Under Secretary of Agriculture in sending this proposed law to the Congress. He said that we need this law to protect consumers, to prohibit fraud and to make competition fair. We need to improve our level of service.

If the result, after all of this, is to reduce these standards of protection to the wholesaler, we think USDA needs to reexamine what they are doing. If it is to reduce the level of protection to the consumers, we think USDA needs to think again what their role should be in terms of the states' rights and also states' obligations.

What we are really talking about is plain old integrity in government. The sealers do not get too many complaints about short weights because the people trust them. They have got you out there as local officials. You are neighbors. You are there to talk to them. They can go in and see you any time. They know when they call you there is going to be somebody on the other end of that telephone or in that office to talk to. If we arrive at a situation where our consumers can no longer really trust our public officials in this area, this will be a grave situation. It seems to us that there is no way in which you can have an inspector of weights and measures and a consumer standing side by side before a tray of meat packages and the consumer says to the inspector, "Now, have you checked all of these?"

Inspector, "Yes ma'am, I have."

Consumer, "And are they all up to weight?"

Inspector, "Well, ma'am, according to the inspection manual that has been given to us, they are all okay."

Consumer, "Well, are they all up to weight?"

Inspector, "Actually, no."

Consumer, "What are you going to do about it?"

Inspector, "We are going to leave the meat on sale because that is what the inspection manual says."

If we arrive at that situation, we are going to lose the most important asset we have in weights and measures—the belief of the people in what we do. That is a very important part of the integrity of government.

As long and detailed as the regulations are in the USDA's inspector's manual, they do not begin to tell the whole story nor the changes that can take place without any further action. The inspector's manual that I have seen is something like 3 or 4 inches thick and the changes come along every week. They are looseleaf filed, and there is no Federal Register action going on while these changes are taking place. One part of that, of course, has to do with net weight changes.

Judge Real said that he was not going to consider the manual itself, because the Federal Register Act, which is an act of Congress, provides that standards of general applicability such as this have to be published in the Federal Register so that the public has an opportunity to comment. There is a very famous case called Hotch versus the United States in the Ninth Circuit which says if an agency adopts a regulation, in effect, through this manual procedure, these regulations are void. The manufacturer who is subject to them can just forget about them. The agency cannot make them comply with them. This is another matter where we need to talk to USDA in some considerable detail. We need to ask how we should deal with this problem of Hotch versus the United States and a whole series of cases in that circuit that follow along from it. How do we deal with the problem of changing regulations through the manual when there is no further opportunity for comment?

We would like to have net weight on the average. We would like to have a wet tare procedure. We would also like to ask the Congress to look at this twenty-day clause, this so-called libel or seizure clause, which we think hinders USDA in its prosecution or holding this product even if it is short weight in getting out of federal plants.

In closing, I want to say that weights and measures laws take substance from what we do. They are not prescribed on high. California has the burden principally in this case, but the State of Hawaii, George Mattimoe's state, has filed an amicus brief. We did not ask Hawaii to do this, they did it on their own because they thought it was important. You might want to talk to your attorney general and ask him if he wants to follow the route that Hawaii did.

We have available a number of copies of the brief, both by Loyal E. Keir, Riverside County, and Allan Goodman, representing California's Attorney General Younger, that can be supplied

to your attorney general. Your attorney general can review these; and if he feels that we are on the right ground, he can make such comment as he wants. If you wish to do this, you can go through Walter Watson of California's Department of Food and Agriculture. He would be happy to supply you with material that you could take to your attorney general.

The law of weights and measures derives, for lawyers, from a very important source and that is the Magna Charta. We have the privilege of administering very few laws which have their direct reference and beginning for integrity in the Magna Charta. As you know, the Magna Charta was forced from King John by the merchants, arising in their day because they needed protection. We still need protection for these merchants. We need it for the packers because they have competitors. They all need to know what the rules are and all should be held to the same plan. We need it for our wholesalers, retailers, and consumers. We are in a tradition running from Magna Charta to the cases started by Becker and Jones. We have 700 years of work behind us and now we are in a period of transition. What is done in this period of transition is going to reflect the next 100 years of weights and measures work. I give you this opportunity and this challenge.

NET WEIGHT—POLICY AND PROCEDURE

An Industry In-Plant Quality Control Program

by EDWARD E. WOLSKI, Manager, Quality Control,
Colgate-Palmolive Company, New York, New York

Our panel's theme is "Net Weight—Policy and Procedure." As an associate member my involvement is with procedure as it relates to achieving and maintaining compliance in the manufacture of my company's products.

An in-plant quality control program has broad application in a manufacturing operation, in the systematic utilization of selected testing procedures to measure the various product properties, and the systematic implementation of correction or adjustment when they are warranted. "Systematic" and "when warranted" are the keys to a well designed and effective program. When warranted means always when correction or adjustment are required, and means never if they are not. Systematic means the adjustment or cor-

rection is by a standard amount, determined through study of the performance characteristics of the operation.

As you know, any series of items being produced will exhibit variation from unit to unit. No two will be exactly the same if you examine them closely enough. The pattern of variation must be determined so that the control points can be established. At any average, or target, value for a product property, there will always be this characteristic pattern of variation. As you would expect, most of the units produced will be near the average, both above and below, with fewer being observed as we move further from the average. The spread of the values is as characteristic of an operation as if it were its fingerprint. Values outside this characteristic pattern are a certain sign that something has gone amiss and correction is required. Likewise, adjusting the knobs and twisting the dials when the process is actually in control will only move the whole thing up or down. If you move it up and then down, the well meant knob twisting has only spread it out more, overall. The only way to reduce the spread is to do something positive by way of a significant change in the design of the system to actually modify its fundamental behavior characteristics.

These facts apply to any property—chemical analysis, size, color, or net weight, for example. When a product is planned, its design must take into account the variation which will be expected to occur so that it can be controlled to produce acceptable goods.

We have all purchased items that leaked, did not fit, did not work, or otherwise have disappointed us. Our own reaction in making it a point not to go back for more of the same is the reason that an effective control program is so important for product success.

By now you are wondering what all this has to do with weights and measures enforcement, or with product compliance. It is really the same thing. In this case the regulations specify one of the design properties of the product—the declared net quantity. The regulations also specify the degree of variation which can occur, as well as the frequency—reasonable error, plus and minus. Handbook 67 tells us what is required of us. Of course, there are problems in knowing what everybody wants us to do, and I will come to those later. For now let us look at Handbook 67 and see what a packager should do.

First, let us see what he needs to consider. Well, he certainly has motivation to operate within the law. The motivation is there if he is honest and ethical, and the consequences surely provide it if he is not.

Second, he has to make a profit. If he does not, he will not have his problem for very long. Failure to control well can clean out the profit in a hurry in two ways. The cost of sorting and scrapping short weight goods is so prohibitive that I am sure I do not need to elaborate on it. Any well designed system will have the target high enough, even if it might have other weaknesses. But he has big trouble in the long term if his target is too high. There can be enormous reduction in profit from what would seem like so little. Think what would be represented by a thimble full of overpack in every carton of cereal, can of beer, carton of detergent, bottle of milk, or bag of sugar sold. For example, my own company produces well over a billion packages a year. Roughly, I estimate that one-sixteenth ounce of unnecessary overfill would amount to about a million dollars a year.

He just cannot afford unnecessary overpack. The job has to be done right. No doubt about it, any responsible packager has to satisfy his obligations, intends to satisfy his obligations, and holds his employees responsible for their performance in that regard.

Our country's business structure is highly competitive. Companies compete in all facets of their corporate performance, and the better managed are the more successful ones which grow. Let us talk about how they do the job .

The operating characteristic for each product on each production line needs to be determined to find out just where the target should be and what the control points are. This will satisfy the requirements of the regulations and for holding the overpacking cost at the minimum consistent with the current equipment performance and product filling characteristics.

But now the expected begins to happen. Think about it. Even this minimum overpacking costs a lot of money. If the product filling characteristic can be improved, or the performance of the equipment improved, some of the overpacking cost can be reduced. And other good things happen at the same time. Because of such improvements the variation is reduced; the units are more uniform. The light ones are not so light and the heavy ones are not so heavy. And this work will, of course, continue as long as the savings in overpacking will pay for the engineering improvements. The cost will go down, the population of packages will be more uniform, and all will be closer to the label quantity.

All is well. The manufacturer is not only doing a better job and operating much closer to the ideal of the regulations, but he has accomplished a savings as well.

But like every other real life story, we had better look again at the happy ending. The hard fact is that the better this job is done, the more likelihood there is for problems to occur. I know this somehow does not sound right, so let me explain.

Packaged goods are inspected, and they should be. But the inspection is traditionally at retail where, at most, two or three cases of an item will usually be on display for sale. What is on the shelf may represent only five or ten seconds of production of that item. They come from a controlled population, with some light and some heavy, just like they are supposed to be and just like everybody wants them to be, and averaging at or above the label just as they should. But which ones are these particular ones? Just what segment of the population was produced during those few seconds? We do know they will be a little light or a little heavy. If they are the heavy ones, all is well. But if they happen to be the light ones, you have no choice but to take the item off sale at that store.

Of course it is not a long term problem because in your many samplings you will see the pattern. You readily identify which packers do their jobs, which ones need a little firm encouragement, and which ones need a hard line approach to straighten them out. And you do a good job in this regard.

But short term is a problem. Store officials rightly turn to the packager and insist on stock replacement and reassurances.

The basic shortcoming in current practice, as I see it, is that although a small sample may be adequate to verify performance for goods packed there individually, or random packs, a small store sample simply does not measure the performance of a high volume, high speed operation whose output is widely and randomly distributed. It can only indicate what happened during the few seconds of production represented by those goods on that particular shelf.

The high volume packer is entitled to the same fair and equitable sampling as is applied to goods which are packed at point of sale. I do not mean to say that current practices are not fair and equitable, it is just that the volume packer will take his lumps while you are establishing that he is doing his job.

There are some weights and measures officials who favor sampling at distribution warehouses or at point of manufacture. I think this would be good. Certainly the good operator would have no trouble with it and should welcome it. The "bad guys" would certainly get hurt. Right now they lose goods by the small store lot; this way they would lose goods in warehouse lots. Wherever the packer who has engineered out all the fat has been able to

reduce his fill, he has, as we have seen, increased the percentage of light in-tolerance units. And he has increased his failure rate and level of problem in store samplings. Representative sampling of warehouse lots would take care of that inequity.

But this poses a dilemma which would take a good deal of thought and work and openmindedness to solve. You see, true equity will require sampling plans designed not on the basis of simplicity, but on a sound statistical basis to reliably determine whether a lot of a given size meets the requirements of the regulations. And these plans would recognize that where a tolerance is required for individual units due to the unavoidable variation which must occur, a tolerance is also necessary for the average of the sample.

If equity is to prevail, it must one day be accepted that individuals cannot be 50 percent minus and 50 percent plus but always average at label quantity or heavier. This is why I said that thought and work and openmindedness would all be required. Many certainly will find it difficult to accept the fact that a light sample average does not mean the lot is below weight. But that is not an insurmountable problem given the assurance that the procedures are soundly designed.

The packager has another problem, and it too is very real. Not all jurisdictions approach inspection and enforcement in the same way, or with the same standards for compliance. Some have isolated themselves from the rest of us. In a country where goods are sold freely in interstate commerce there are a few jurisdictions who enforce minimum regulations when the balance of the country, the economy, and the competitive pricing of goods are based on the principle of the average. What that means is that in those locations the packager fails nearly all the time. Almost every lot will contain some light in-tolerance units. These are considered as individual violations.

Another question comes to mind. At what point does the packager's liability logically cease? For example, some products lose moisture and shrink with time. The manufacturer accepts the responsibility to provide for such shrinkage. But what is a reasonable time? I know of five citations for five individual units which were two and a half years old. The case in point is only a single small occurrence, but it happened. He should be fully accountable where he has control, but where he has no control at all his responsibility should stop somewhere.

There are other questions which will eventually require resolution. Not long ago an imported food shipment was found to show excessive weight variation and was impounded by the FDA at

port of entry. Without going into the details, the matter was resolved on reinspection and the goods found to be in compliance and released. From all of this we learned that on tolerance for individuals, goods acceptable to weights and measures can be condemned by FDA. Goods acceptable to FDA on tolerance can fail weights and measures requirements.

What this comes to is that the packager can certainly design and engineer a system for control and can make it work; but he can have several masters. They can require conflicting standards of performance for compliance.

There is a need for change here and there to provide for uniformity. There is a need for some change to provide for broader scale sampling for better and more equitable control of goods which are widely distributed.

But these are not crying needs. They would represent just that—improvement. The present system is a good one and does its job well. There are problems—of course there are. But they are small when one considers the overall order which exists in the marketplace due to your efforts. In noting these needs, it certainly has not been my purpose to advocate sweeping change. Rather, I would hope I have planted the seed for some constructive thought.

DISCUSSION

MR. H. COUDEN (Safeway Stores, Inc.): From the standpoint of Dr. Brickenkamp and Mr. Fried, I am disturbed that they are considering tables of tolerances, if indeed that is what they mean by separate products. I think that for industry to accept a comprehensive sampling plan that must stand for the next 100 years, as Herb Cohen has said, that sampling plan must have universal applicability to all products and for all types of weights and measures whether it be by weight, volume, count, or linear measure. We want that in industry, particularly in the retail business which I represent, because we have 9,500 food items alone and hundreds of products. I think that any sampling plan must be applicable also wherever it is valid to use that sampling plan, not just in one location.

I want to caution the panelists and those in government who are responsible for this plan not to fall prey to what we will call the unique variables syndrome by different industries who say they have their unique variables. I have written specifications for the processing and finished products of over 400 items. I know that every item absolutely has its own unique variables; but I do not know of any one variable which is unique to a single item,

although I would recommend that you make allowances for that. Just leave an opening in your procedure, whatever it shall be.

I would say that a successful and an acceptable package testing program must have an assured, built-in, high degree of confidence that the enforcement action it dictates is correct and that it is not the result of sampling error. We can statistically determine the error. There is no reason why Mr. Fried's method should be any different or why he should regard it as different because the number of samples in one plan is different from the number of samples in another plan. Statistically, we can arrive at the same level of confidence by any number of sampling plans.

Another guideline I would give you is that an enforcement action must be measured against the lot being tested, not against the samples. This is a tremendous, devastating falacy in the USDA proposal that was given to us last December, unless, of course, the action is just to be taken against the samples that are measured. But if you are going to take action against the lot, you must measure your action against the lot and not just against the samples.

The procedure, of course, must define unreasonable error, and I know you have all brought that into your discussions today. Unreasonable error can be defined in a manner that is not the table of tolerances which you all seem to favor.

In Article 5 of California, and the same procedure that has been adopted in Hawaii, we use unreasonable error definition as a lot characteristic of the values which have been received on the basis of the samples. A 1.96 sigma, just to simplify the matter, has been used as unreasonable error there. This system has been successful for over 14 years in those two states. There is no reason to believe that such a system cannot be used for defining unreasonable error rather than all these people, all these man hours, all these tables you folks have talked about. I would like to hear why you believe this not to be true.

I am very disturbed that there should be tolerance tables because any tolerance table is going to be discriminating somewhere. If you pack grapefruit you have one tolerance; if you pack rice or sugar you have another tolerance.

MR. E. E. WOLSKI (Colgate-Palmolive Co.): If you recall, Dr. Brickenkamp made the comment about tolerance tables and I commented about broader scale sampling. The broader scale sampling would provide a fair sampling with the samples selected from, I would visualize, a chart or table of sample plans to guide the inspector. It is very difficult to expect all of the inspectors to be well versed in statistics. Therefore, I assume the concept would be that for various product categories there would be

determined tolerances which would coincide, having been treated statistically, with the variation pattern which would be significantly different from one product to another.

Take, for example, my own products. I can control the net fill of toothpaste to something in terms of less than one-hundredth of an ounce. It is filled like a hypodermic. It is a piston fill with a micrometer adjustment and the product is extremely uniform. You put it in the tube. Now I have detergents which vary in their density. With your high volume filling, you measure a volume and you control the weight of that volume. I do not have the degree of control over detergents that I do over toothpaste. There has to be some basis of determining what is reasonable. Unless each and every inspector is well versed and able to determine what those statistics are on the scene, he cannot function. I think that is what Dr. Brickenkamp meant by tables.

Dr. C. S. Brickenkamp (NBS): I mentioned that we would have to make a somewhat arbitrary decision as to what equity was if we did not supply, at some point in time, tables. What I suggested was that the preliminary document not have these tables. You cannot wait that long. There is an amount of arbitrariness here that will strike some of the industrial sectors short because we have to base it on what evidence we now have. We can make estimates and we can make some preliminary statements about these variations. However, if you are going to continue with the average concept and go for a true balance for the buyer/seller, we must arrive at the equitable solution, both now and at some future date if data is given on variations. I am not saying we have this data now and I address even Article 5 as having to make certain arbitrary decisions about no single process having better control than any other packaging process. I am simply saying that there is evidence that can be collected to show whether or not that decision or any other has any basis in fact.

Mr. Fried (USDA): As far as the concept of Article 5 versus the listing of products by categories and thus defining the amount of reasonable variation, I believe there is a concept there that has to be decided. In one case we are saying that the consumer is entitled to know, provided this is adopted, that in all cases X amount below the stated net weight would be considered unreasonable. If I am correct, this differs from the Article 5 concept in that individual lots can contain different unreasonable errors because the determination of what is unreasonable is made on the basis of a sample of each lot which leaves the consumer without any knowledge of what, in that particular purchase, might be considered an unreasonable error. I think this is the difference

in concept between the two; and it is something that has to be decided in adopting a final procedure.

MR. H. COHEN (California): May I add a comment to this? I am not a statistician. I have had my head filled by statisticians for the last couple of years. I think Mr. Couden first makes the point for us that not all the expertise is in the government. I tried to make the point in my talk that we are all in this together and we hold no hard feelings for any company involved in any lawsuit with us. We take the position that there is no place for enmity here. We all treat this as a problem of universality from every day forward. When industry is able to come forward with suggestions like this, they need to be taken account of and considered carefully because they do have tremendous expertise.

In the Code of Federal Regulations in 7 CFR Part 43, the United States Department of Agriculture has a whole series of statistical sampling plans dealing with product attributes. As far as we are able to determine, they would certainly apply to net weight attributes, although there are other attributes of a product.

One of the things I think we need ot talk with USDA about is whether or not these sampling plans, which are statistically sound, should not be used for meat products as well as grain or other products. These plans work on the traditional 95 percent assurance level. Our statisticians would like to see the the same type of statistical attributes applied in the sale of these food products.

We need to think of philosophy too. In the sale of borax, for example, USDA has a circular which they put out saying borax dries out. If it is sold to farmers, it should be overpacked sufficiently so that after it has dried out that farmer is going to get exactly the labeled weight. We need to bring industry into this, too; and we need to do it before we go out into the Federal Register again.

MR. G. L. JOHNSON (Kentucky): My question is to Mr. Fried. Using the example of fresh poultry, under your authority where would you require full net weight using the average concept—the packing plant, when it reaches the wholesaler or distributor, at the retailer, or when the consumer purchases the package? When would you require full net weight on the average concept?

MR. FRIED: Our requirements are contained in our manual. Let me quote our proposal and how it would work. In the official establishment the product would have to meet that average weight. If the product continued to lose weight during distribution, any point where it is checked is the point that it is judged. Therefore, the procedure listed in the proposal would state that wherever

you make the determination, that is where the average would have to be met and that is where the individual unreasonable shortages would be applied.

MR. JOHNSON: Would you consider my inspectors making an inspection on the unloading dock at the first point of entry in my state in error if they ordered off sale a shipment that was found to be short weight at that place, using the average concept?

MR. FRIED: Under the terms and procedures of the proposal, they would have every right to order that off sale. Mr. Cohen has mentioned this twenty-day detention, which is in our law. This is only beyond the plan, not in the plan itself. We are limited and should be limited, because if we do not take action within twenty days we cannot sit on a product forever. But a state is not limited by that twenty-day period.

In other words, having once found a product, exerting the concurrent jurisdiction, and having found the product out of compliance by the procedure as it is finally adopted, you may then take action against the product as given to you by your own state law.

MR. COHEN: I may say there is a difference in legal interpretation of the Wholesome Meat Act between counsel for USDA and counsel for the Attorney General of California. We just do not know of any federal court cases supporting the USDA counsel's position. It is, again, one of these things that needs to be clarified and set down in the regulations because we cannot operate as enforcement officials on the basis of different interpretations of lawyers.

MR. W. H. KORTH (Ventura County, California): I have a couple of questions for Mr. Fried. If there has been a problem that has not been corrected, weights and measures has traditionally taken legal action. Mr. Cohen has alluded to the comparison with the FDA case which is one of the few to be found. Over the years how many legal actions and prosecutions has the USDA instituted and carried out?

MR. FRIED: Prior to the Wholesome Meat Act, our authority ended at the door of the official establishment. Under the Wholesome Meat Act and the Wholesome Poultry Products Act, our authority has been extended. However, we have traditionally left the enforcement of weights and measures to the local authorities. We do not have the manpower to expend on going back through retail outlets to recheck product that has previously been found to be acceptable.

MR. KORTH: Has the USDA considered Article 5 as a starting place to work out a regulation that would be acceptable to enforcement officials and industry as Article 5 is and has been so far?

MR. FRIED: Basically, as far as procedures go, there is very little difference in concept. Mr. Cohen laughed at the inspector having to tell the consumer about whether packages were in compliance or not using this manual, yet at the same time he closed with a plea that we use the average concept. We all agree so far that the average concept is the way to go.

I believe that I answered the differences between our determination of unreasonable shortages and California Article 5 by saying that Article 5 bases the unreasonable shortage upon each individual lot; whereas we have proposed basing it upon an industrywide type of acceptability that would give a certain base to the consumer. Some decisions have to be made. You cannot please everyone because everyone has his own way of doing things.

DR. BRICKENKAMP: When I asked weights and measures officials whether or not they had tried to use Article 5, I always got the response, except from California, that it is a little too complicated.

MR. COHEN: We have no monopoly on brains in California. If our people can use Article 5, everybody can.

There is a more important point that is raised here. Why can't USDA say that packages must meet the state standards as they are now and no state can have a standard which is less stringent than USDA's proposal but for the time being it can use a more stringent standard if it has one? We will work out the details and when we come to something that the weights and measures community feels is acceptable, then we will move into this national program. Why are we being forced into this mold? USDA has to make some decisions. There is a universe of experience out there among you people. We suggest that what we have lived with for the last 100 years would suffice very well for the next year or so while this national program is being worked out. We see nothing in USDA's law that says this cannot, in fact, be worked out. It is a matter of whether USDA wants to go this way.

MR. FRIED: I believe that the Supreme Court has found that the Wholesome Meat Act does say that you cannot put in a standard which is more stringent than USDA's. Additional requirements cannot be imposed upon federal products.

MR. COHEN: Sure. All USDA has to do is say we adopt state standards.

MR. E. STADOLNIK (Massachusetts): My question is directed to Mr. Fried. Could you clarify USDA's stand on the authority of state and local weights and measures officials under the provisions of their state and local ordinance to test and seal scales within USDA packing plants.

MR. FRIED: Our general counsel has provided me with the opin-

ion that this is not possible. I do not know if this has ever been tested in court. In fact, somewhere in the back of my mind I have the impression that perhaps this is being tested at this time. All I can do is give you an opinion which was given to me and that is no, you cannot.

MR. COHEN: The Wholesome Meat Act says the states are to have concurrent jurisdiction and that this is to be done for the benefit of packers to prevent unfair competition. If the states have concurrent jurisdiction, we cannot understand why USDA can't let state inspectors help them out a little bit. If USDA is going to take the approach that concurrent jurisdiction means exclusive jurisdiction, except where they say, no operational plan put out is going to long have the results that Congress intended because there will never be enough USDA inspectors to do this job. I know that USDA has men on routes who may visit a plant one hour a day and packages are coming out of these plants all day long. What we must have in terms of concurrent jurisdiction is concurrent cooperation.

Mr. Stadolnik's question is very pertinent. It is the type of thing we need to talk to USDA about very carefully before the next set of regulations goes to the Federal Register.

MR. M. TRUJILLO (Puerto Rico): Is the Department of Agriculture really interested in enforcement of whatever they put out in the Federal Register? If so, they better do something that is coherent with a state's activities because our experience in Puerto Rico is that they have one inspector. He has not been able to come to my office to give a briefing to my inspectors on other activities, like the type of meat—whether it is choice, tender, etc. He has not been able to come around. He is too busy and I understand that he is busy. How is he going to have time, in addition, to check packages or scales? I do not see how. If that is the case and if it is correct to assume that USDA is interested in its regulations being enforced, why not let the states develop the standards for net weight at the retail level where the consumer buys the product?

Some of USDA's proposals, if passed, will produce labeling that will go not against our weights and measures regulation but against our misleading advertising and practices regulation, because it will mislead the consumer. I assume USDA is not interested in that. My thinking is that maybe USDA could defer its rule making and formally ask the National Bureau of Standards for a comprehensive comment on this regulation. I am sure the Bureau will come out with something that is in the line of thinking with the weights and measures enforcement officers in the Nation.

I also would like to ask Mr. Cohen a question. I am an attorney, too, but I have not read the provisions that are now called into question, especially the Wholesome Meat Act. I would like to know the constitutional authority under which these acts have been passed because from that point on it would depend upon the extent of the concurrence of the state jurisdiction and to the extent they can or cannot be preempted. My position is that the weights and measures legislation is enacted by the states under their police power authority. I would like to know the constitutional base for these USDA and FDA acts.

MR. COHEN: There are two sides to the question in terms of original jurisdiction under the Constitution. I mentioned Loyal Keir, who in his brief to the Ninth Circuit argues that there is inherent power in the states to control a fraud. Whenever a product is short weight, this is fraud and nothing that the Federal Government can do can take away this reserve power.

The Federal Meat Act or any other act Congress passes cannot deprive the states of jurisdiction in this manner. He cites a number of cases, which I am sure you are familiar with, saying that particularly in the field of meat and food products the states have plenary jurisdiction. He goes on to discuss the point of what concurrent jurisdiction means. He makes quite an argument that in the cases involved in Prohibition the states were given concurrent jurisdiction. They had tremendous power to control liquor, as you well know, until the Constitution was amended.

There has not been any Constitutional amendment here. This is one of the areas where the attorneys general of the various states, in looking over Mr. Keir's argument or Mr. Goodman's argument, might be able to help the Ninth Circuit Court of Appeals in reaching a correct decision.

MR. FRIED: We are not, in our proposal, talking about product in which a net weight statement is placed on the package at retail. You can do whatever you want with that and in the area of fresh meats and fresh poultry, much of it is sold in that manner. So we are not talking about that particular type of product. Nor are we talking about a product which is under state inspection. We are only talking about federally inspected product, and there when we talk about enforcement, that is our business. We have between 8,000 and 9,000 inspectors who are stationed in plants every day whose duty is to see that the product leaving that plant is wholesome, unadulterated, and truthfully labeled. The truthful labeling part contains the net weight as well, so we are interested in enforcement. The point I made before, I am willing to make again; that is, having left the plant, we do not have the man-

power necessary to go beyond the plant and recheck something that has been produced under inspection and found acceptable to begin with.

The states then can exert authority over federally inspected product, provided we can agree upon a regulation and one that can be found equitable. We are looking for input from everyone. We do not consider ourselves the only experts in the field. There are many people who can provide expertise; this is the purpose of a proposal, to get expert comments.

TEMPERATURE CORRECTION OF PETROLEUM PRODUCTS AT RETAIL

Why Temperature Correction?

Presented by GEORGE E. MATTIMOE, Deputy Director, Division of Weights and Measures, Department of Agriculture, State of Hawaii

Just by way of preamble, we cite the general picture as it relates to Hawaii. Any identification of companies or equipment is incidental to the pictorial presentation and can be assumed to be fictitious. The Union Oil Company of California, while complying with the requirements of temperature correction in Hawaii, has not expressed any support or opposition for our program. The inclusion of various oil company slides is merely indicative of their goodwill.

We present the following as an informational exposure to the petroleum program now ongoing in Hawaii. We ask consideration of the possibility of amending the present Liquid Measuring Device Code so as to make temperature correction permissive in those jurisdictions where it will have an economic benefit. Such a benefit is factual in Hawaii, yet it was impossible to procure a model or guide to follow in establishing the program.

It is our hope that by making such a proposal permissive, other jurisdictions will only have to open Handbook 44 to the Liquid Measuring Device section to determine the correct and uniform course of action to follow, instead of suffering through the original sessions of saber-rattling as we did three years ago.

It is our proposal that dispensers currently in service remain in service and be adjusted to accommodate the average temperature for a given locale and for a given period of time at local

option. While the approach is a step in the right direction, it will not be a panacea for all conditions or all installations. However, it will permit not only the development of equipment but its sale and application, which has automatic temperature compensating capabilities. This request should not create any great furor, since the exact precedent exists in the LPG liquid, the LPG vapor, and the proposed cryogenic codes—we merely ask that the codes be uniform.

Cost figures have been tossed about—some approaching $700,000,000, which when divided by the 1,750,000 dispensers equals $400 per device. I do not know about all other jurisdictions, but we have many pumps complying with the temperature compensation requirements of Hawaii that did not cost $400 new. In addition, at that figure it would have cost $1,540,000 to effect compliance in Hawaii.

The facts are that we phased in the adjustment process over one year's time; and we caused the replacement of about 50 dispensers, 10 or 11 of which were old visibles and most of the others were of such vintage that their adjustment devices were frozen or nonexistent. So replacement was not a function of our temperature correction law; replacement was due mainly to old age.

The division, in cooperation with the Hawaii Automotive Retail Gasoline Dealers Association, recalibrated 80 percent to 85 percent of all the dispensers. The total cost was minimal since it was effected during our routine inspection. The $700,000,000 does not appear realistic since our cost for the whole project, computed at $13.95 per hour, was about $50,400, or just about 15 percent above our normal cost to effect dispenser inspection ($36,000).

We must mention that all adjustments, all energy calculations, and all tables employed were either American Petroleum Institute (API) documents, or they were derived from such documents. If there are any errors or transpositions, they do not detract from the fact that gasoline expands and contracts.

By way of background information, the state of Hawaii presented a technical dissertation on the necessity of temperature correction in the measurement of petroleum products to the interim committees in their meetings last January. According to the interim report, that is the reason we are here today. The slide presentation we made last January was only slightly dissimilar from that which follows.

On November 20, 1973, we directed a letter to Mr. Harold Wollin, as executive secretary of the National Conference on Weights and Measures, requesting that serious consideration be given to amending the present Liquid Measuring Device Code in

Handbook 44 so as to extend to the consumer those provisions relating to temperature correction now exclusively reserved for industry. The request was based in part upon the findings of our five-year study and the fact that the Liquid Measuring Device Code, being the oldest of the codes, is inconsistent with the newer Liquefied Petroleum Gas Liquid Measuring Device Code, the Liquefied Petroleum Gas Vapor Measuring Device Code, and the proposed Cryogenic Code, all of which make permissive temperature correction to the ultimate consumer without any great confusion.

To amplify our position, we direct your attention to the 96 major sections of the Liquid Measuring Device Code. Fourteen of these sections, or 14.58 percent, are devoted to temperature correction, involving the industry's benefit; but not a single one of the sections is permissive of application to the consumer's benefit.

Recognizing that the Liquid Measuring Device Code predates 1935, we are still compelled to question the creditability of the Conference motto that "Equity Shall Prevail" in this case. In effect, the code actually provides for equitable transactions only in those rare instances when the product temperature is 60°F.

By way of contrast, a quick look at the Liquefied Petroleum Gas Liquid Measuring Device Code reveals 70 major sections of which 12, or 17.14 percent, are devoted to temperature correction in some detail. There is no discriminatory inconsistency in this code, however, since all 12 provisions are applicable equally to the benefit of the industry, the retailer, and the ultimate consumer.

A similar check of the Liquefied Petroleum Gas Vapor Measuring Device Code reveals 50 major sections of which 6, or 12 percent, are devoted to temperature correction in some detail; and in addition to temperature correction, consideration of density and altitude differential are included.

Reference to the proposed Cryogenic Code reveals that a similar pattern exists in all three of the newer codes which was excluded from the Liquid Measuring Device Code and which provides a definition of the unit of measure which may be used by parties to a transaction. Our request at the interim committee meetings, and now to the Conference as a whole, would merely extend this definition to the retailer and the consumer. Logic dictates such an extension, or such a provision, for temperature correction to the retailer; and the ultimate consumer should not have been included in the three newer codes.

By using building blocks it is sometimes easier to convey a clearer picture of the problem and its obvious solution. (See figure 1.) The center cube is a 231 cubic inch displacement block and

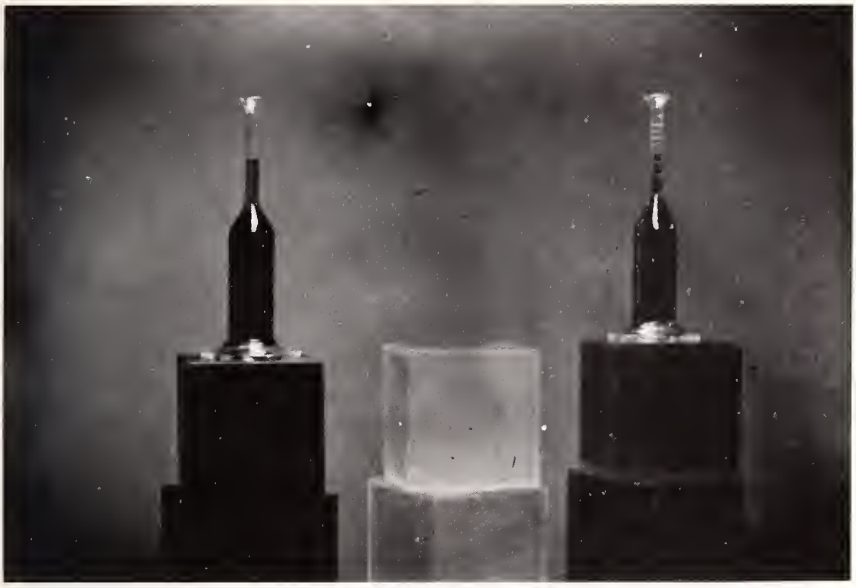


FIGURE 1

represents one gallon of gasoline at 60°F whose gravity is 58°API. The cube on the left is a 228.239 cubic inch displacement block and represents the same one gallon of gasoline cooled to 40°F. The cube on the right is a 233.838 cubic inch displacement block and represents the same one gallon of gasoline heated to 80°F.

Each of these three blocks has the following in common:

1. They are each one U.S. petroleum gallon of 231 cubic inches at 60°F
2. They each weigh 6.216 pounds irrespective of their temperature
3. They each contain 18,860 net Btu's (net heat of combustion).

When observed side by side the difference of 2.8 cubic inches of displacement in each block is barely discernible. When stacked side by side (see figure 2), the progressive difference block by block becomes quite apparent. The center stack of 1155 cubic inches represents 5 U.S. petroleum gallons at 60°F of a gasoline whose gravity is 58°API. The stack of 1141 cubic inches on the left represents the same 5 U.S. petroleum gallons now cooled to a more dense product occupying less space at 40°F. The stack of 1169 cubic inches on the right represents the same 5 U.S. petroleum gallons now heated to a less dense product occupying more space at 80°F.

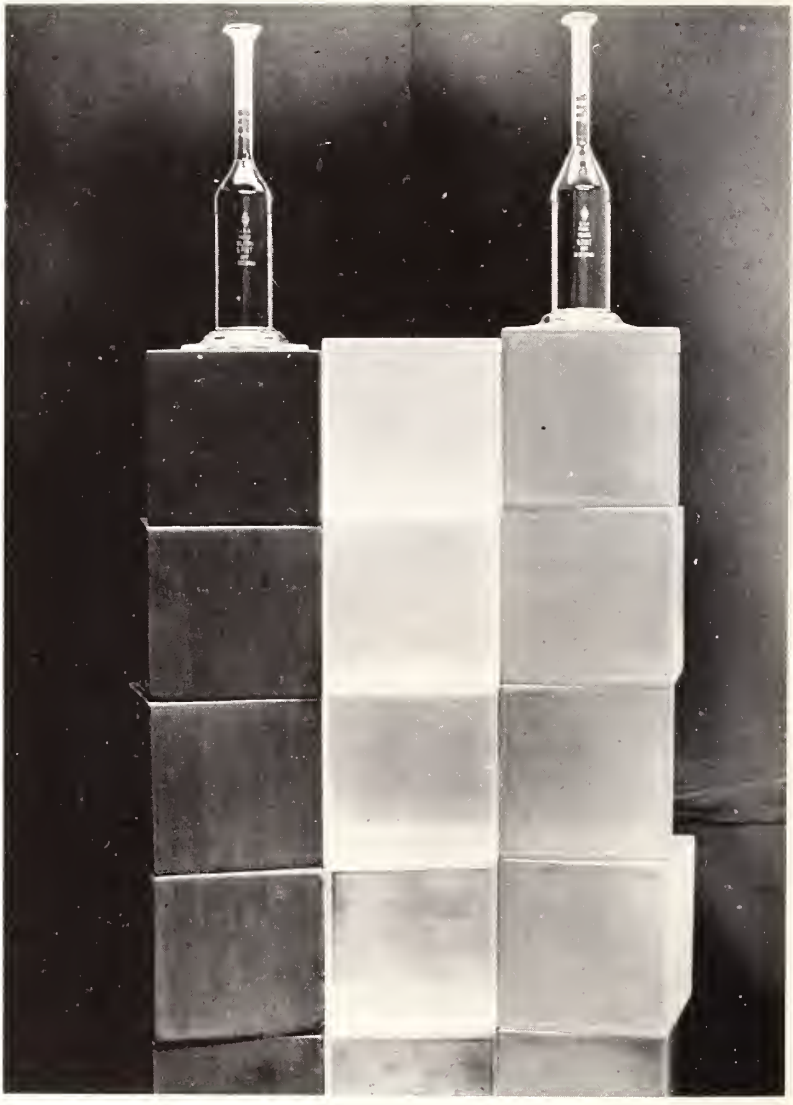


FIGURE 2

The one-half pint graduate on top of the stack on the right reveals the 14 cubic inches of expanded volume not delivered to the consumer when he receives 1155 cubic inches of 80°F gasoline. The one-half pint graduate on top of the stack on the left reveals the 14 cubic inches of contracted volume by which the retailer is mandated by law to short himself whenever he delivers 1155 cubic inches of 40°F gasoline.

To illustrate, 5 U.S. petroleum gallons of gasoline at 60°F, whose density is 58°API, have the following physical characteristics (which by definition they should):

They weigh:	6.216	× 5	=	31.08 pounds
They contains:	18860	× 5	=	94300 Net Btu's
They occupy:	231	× 5	=	1155 cubic inches

Under the provision of the existing Liquid Measuring Device Code a retailer is compelled to deliver as 5 U.S. petroleum gallons 1155 cubic inches of gasoline irrespective of product temperature.

This means that when the gasoline temperature is 80°F and in compliance with the existing Liquid Measuring Device Code, on every alleged 5-gallon sale the consumer is being shorted 14 cubic inches of volume, 1145 net Btu's of energy and, at 70 cents a gallon, about 4 2/10 cents because at 80°F the alleged 5 gallons of gasoline exhibit the following characteristics:

They weigh:	6.140	× 5	=	30.70 pounds
				Not 31.08 as they should
They contain:	18631	× 5	=	93155 Net Btu's
				Not 94300, as they should
They occupy:	231	× 5	=	1155 cubic inches
				Not 1169 cubic inches, as they should

When the temperature of the gasoline is 40°F and in compliance with the existing Liquid Measuring Device Code, on every alleged 5-gallon sale the retailer is being shorted 14 cubic inches of volume, 1145 Btu's of energy and, at 70 cents a gallon, about 4 2/10 cents because at 40°F the alleged 5 gallons of gasoline exhibit the following characteristics:

They weigh:	6.291	× 5	=	31.45 pounds
				Not 31.08 as they should
They contain:	19088	× 5	=	95440 Net Btu's
				Not 94300 as they should
They occupy:	231	× 5	=	1155 cubic inches
				Not 1141 as they should

By way of analyzing the retailer's plight, let us look at two separate 200,000 gallons a month Union Oil Company of California stations, one in Honolulu, Hawaii, and the other in Juneau, Alaska.

It is a matter of record that each station operator receives temperature correction on all deliveries from his supplier. How-

ever, only in Honolulu is the station operator permitted to deal with his customers in terms of the same size gallon he receives from his supplier. In Juneau, the station operator is required to deliver 1155 cubic inches of gasoline, in compliance with the existing Liquid Measuring Device Code as 5 U.S. petroleum gallons, to his customers irrespective of the product temperature and irrespective of the fact that in the past thirty years the mean average temperature has never warmed up to 60°F (being on the average 40°; and ranging from 27° to 57°F).

In Honolulu, the station operator delivers the same size gallon to the consumer that he receives from his supplier; specifically, 233.8 cubic inches per gallon or, for 5 U.S. petroleum gallons, 1169 cubic inches.

Their relative costs are:

Cost of gasoline in Juneau
200,000 × $0.4500 (rack price) = $90,000 per month
Cost of gasoline in Honolulu
200,000 × $0.4500 (rack price) = $90,000 per month

Revenue Juneau

The 200,000 gallons at 60°F have contracted into 197,500 gallons at 40°F. With the retail dispensers calibrated to deliver 231 cubic inches at 60°F, the station operator loses 2.8 cubic inches on each 40°F gallon he sells or 14 cubic inches on each alleged 5 gallon delivery.

The Juneau retail dispensers must be calibrated to deliver 228.2 cubic inches of gasoline at 40°F per gallon to eliminate the retailer loss and the consumer windfall. This loss equals $1750 per month, or $21,000 a year, and is determined by the difference in revenue generated on the sale of 197,500 gallons at 70 cents a gallon as opposed to the revenue which would have been generated on the sale of 200,000 gallons at 70 cents a gallon.

Revenue Honolulu

The 200,000 gallons at 60°F have expanded into 202,040 gallons at 80°F. With the retail dispensers calibrated to deliver 233.8 cubic inches of 80°F gasoline per gallon, the retailer delivers 1169 cubic inches per 5 gallon delivery and all parties to the transaction are treated equitably. No one loses and no one gains since the 2040 gallons of expanded 80°F gasoline are received by the station operator and delivered to the consumer.

The 200,000 gallons generate $140,000 at 70 cents a gallon; so the Honolulu station operator is $1750 a month better off than the Juneau station operator because of temperature correction in Hawaii.

Since only the Honolulu station operator delivers the required weight of 6.216 pounds and 18860 net Btu's of energy as specified by API, for a gallon of gasoline at 60°F with a density or gravity of 58°API, the Juneau station operator is obviously delivering something other than a gallon of gasoline.

It is a fact by definition that whenever a station operator delivers a gallon of gasoline at 40°F through dispensers calibrated for gasoline at 60°F, he shorts himself. It is a curious paradox that without temperature correction there are those who cite this over-delivery to customers as being a justifiable reason why such an inequity should not be changed.

Yet, most of these same inspectors would be the first to advise a baker that he was delivering 17-ounce loaves of bread as 1 pound, in spite of the consumers' unjust enrichment; or conversely should he be delivering 15 ounces as 1 pound, off-sale would be instantaneous! One can only ask, "Why not gasoline?" The answer to this rhetorical question is, "Because the Liquid Measuring Device Code of Handbook 44 does not provide for it!" We believe this should be changed.

The problem is not at all peculiar to Alaska and Hawaii. The northern area of the United States sells gasoline at 40°F because the thirty-year mean average annual temperature is below 60°F. The southern area of the United States sells gasoline at 80°F because the thirty-year mean average annual temperature is above 60°F. The central area of the United States sells gasoline at 60°F because the thirty-year mean average annual temperature is 60°F.

Presumably, along this 60°F isotherm the "average concept" or the "balance-out" theory would prevail, wherein the cold dense gasoline over-delivered in the winter would be offset by the warm less-dense gasoline short-delivered in summer. Such a presumption is wrong and is based upon the premise that two wrongs make a right. How does shorting the consumer in the warm season and shorting the retailer in the cold season equate to equity? It does not and there is nothing equitable about it!

Couple these two wrongs with the fact that the average American motorist drives 10.05 percent more in the warm season than in the winter season and you amplify the consumer disparity.

Under CFR 19, section 13.10(B), the U.S. Treasury Department, through the Bureau of Customs, defines a U.S. petroleum

gallon as 231 cubic inches at 60°F and admonishes all importers to correct observed volume of any imported petroleum products brought into the United States to U.S. petroleum gallons at 60°F by application of D–1250, table 6, as does the Federal Trade Commission under CFR 16, section 500.8(b) relating to packaged petroleum products.

The following societies have likewise adopted as a standard table 6 of D–1250:

The American Society of Testing and Materials
The American Petroleum Institute
The Institute of Petroleum, Great Britain
The American National Standards Institute
The International Standards Organization

Adoption of table 6 of D–1250 by the above apparently escaped the notice of this Conference, thus was not included in the Liquid Measuring Device Code.

As final argument in support of our proposal, we direct your attention to D–1250, table 8, entitled "Pounds per U.S. Gallon and U.S. Gallons per Pound," which is identical to API table 6A1.1 in chapter 6 of the Technical Data Book on Petroleum Refining.

Under the coordinates of 58°API and pounds per U.S. gallon, we observe that a gallon meeting this requirement weighs 6.216 pounds and it can occupy any amount of space from 244.440 cubic inches at 150°F to 222.940 cubic inches at 0°F. So we alert you to the obvious fact that even though the space occupied by a gallon changes with temperature, its weight and net heat of combustion (net Btu's) remain constant.

The device in figure 3, a somewhat antiquated Boyle prover designed with a unique adjustable reference, is placed on a scale which is tared to reflect zero load. We then fill exactly 1155 cubic inches into the prover and establish the net weight at 31.08 pounds ($5 \times 6.216 = 31.08$). We verify the temperature of the gasoline at 60°F; and we verify, by hydrometer, the gravity as 58°API. By definition and by observation, we have 5 U.S. petroleum gallons in the prover.

Now by application of ice we pull the temperature of the gasoline down to 40°F and observe in the cooling process that the miniscus drops below the zero reference as the gasoline temperature drops. The colder the gasoline, the more the miniscus drops.

At 40°F (see figure 4), the miniscus most nearly aligns with minus 14 cubic inches. The observed volume is now only 1141

FIGURE 3

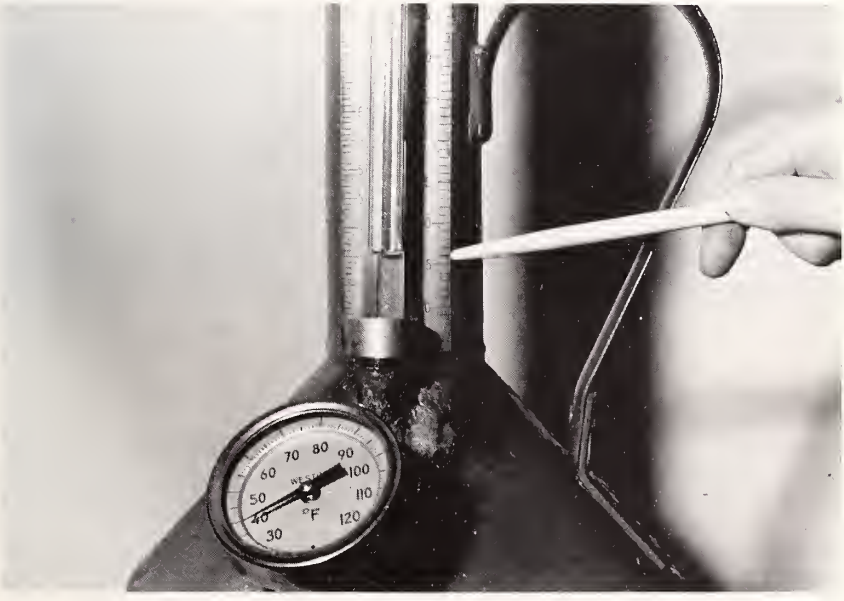


FIGURE 4

cubic inches. While this might appear to be less than 5 U.S. petroleum gallons, it is not. How can it be when all we have done is cool it? Its weight, which has remained constant during the cooling process, belies the fact that it is any amount other than 5 U.S. petroleum gallons.

By application of heat we raise the temperature of the gasoline to 80°F, noting that as the temperature rises the miniscus rises in the sight glass (see figure 5). The observed volume is now 1169 cubic inches. While this might appear to be more than 5 U.S. petroleum gallons, it is not. How can it be when all we have done is heat it? Its weight, which has remained constant during the heating process, belies the fact that it is any amount other than 5 U.S. petroleum gallons.

FIGURE 5

In compliance with the Liquid Measuring Device Code, we skim off the 14 cubic inches of expanded volume of gasoline at 80°F, causing the miniscus to drop back down to the zero reference. As we draw off the 14 cubic inches, the equilibrium of the scale is disturbed and ultimately reflects an underweight condition not evidenced when we heated or cooled the gasoline.

We reestablish the net weight of the remaining 1155 cubic inches of 80°F gasoline and observe that it now weighs only 30.70 pounds, or 0.38 pounds less than the original 1155 cubic

inches of 60°F gasoline weighed. The net Btu's have decreased to 17,731 per gallon, or 88,655 total, instead of 94,300 specified.

To make a point, we again apply heat and raise the temperature to 100°F, noting that as the temperature increases the volume increases. At 100°F we have again 1169 cubic inches of gasoline whose weight is still 30.70 pounds. We again skim off the 14 cubic inches of expanded gasoline causing the miniscus to drop back down to the zero reference. Note that the 1155 cubic inches of 100°F gasoline only weighs 29.32 pounds and the net Btu's have decreased to 16,602 per gallon, or 83,010 for the alleged 5 gallons instead of the 94,300 specified.

We repeat this procedure; that is, heating and skimming, until the temperature of the gasoline has been elevated to 160°F, when we again skim off the 14 cubic inches of expanded gasoline leaving 1155 cubic inches of 160°F gasoline in the prover. All totaled, we have skimmed off 70 cubic inches of gasoline and we still have as much left as we started with, or 1155 cubic inches. This could be more lucrative than a money tree and certainly it is legal under the existing Liquid Measuring Device Code. The weight has now decreased to 28.85 pounds, the energy contained in the 1155 cubic inches has decreased to 13215 net Btu's per gallon, or 66,060 for the alleged 5 gallons instead of the 14,300 as specified. Yet, we have some people who would still contend that this 1155 cubic inches of 160°F gasoline is still 5 gallons.

We wonder if those same people would condone the installation of steam coils in all retail gasoline service station underground tanks so that the dealer could heat up his gasoline and thereby have more to sell. It would be one way to resolve the fuel shortage—just heat up what we have! Unfortunately, such an approach is permissible, even if morally wrong, under the existing Liquid Measuring Device Code.

We ask that you amend the Liquid Measuring Device Code in Handbook 44 to provide for temperature correction at all levels of the distribution hierarchy. It seems to this observer that this Conference, not the industry, may well have been the major impediment to the development of equipment capable of accommodating the delivery of petroleum products at any temperature by the very existence of the present Liquid Measuring Device Code, which makes it illogical to expect any pump manufacturer to research and market a retail level gasoline dispenser with automatic temperature compensating capabilities when such a device is precluded from sale by this Conference's present Liquid Measuring Device Code.

By way of summation, you may wonder why the Conference has done nothing about the code before now, considering that:

1. When industry extracts crude in Venezuela, Alaska, Newfoundland, Sumatra, or even Saudi Arabia (when it is available), they account for it in terms of U.S. petroleum gallons of 231 cubic inches at 60°F
2. When they ship it, they account for it in terms of U.S. petroleum gallons at 60°F
3. When they distribute it, they account for it in terms of U.S. petroleum gallons at 60°F
4. When they process it, they account for it in terms of U.S. petroleum gallons at 60°F
5. When they transport it, they account for it in terms of U.S. petroleum gallons at 60°F
6. When they wholesale it, they account for it in terms of U.S. petroleum gallons at 60°F.
7. When they prepackage it into quart containers, they account for it in terms of U.S. petroleum gallons at 60°F
8. When they barrel it into 55-gallon drums, they account for it in terms of U.S. petroleum gallons at 60°F
9. When they fill it into this container (airplane) as the instrument panel verifies, they account for it in terms of U.S. petroleum gallons at 60°F.
10. Only when they fill it into this container (automobile) do they ignore the temperature and, in effect, deliver any old amount as a gallon—depending upon the gasoline temperature.

This presentation would not be complete if we failed to mention the tolerances established for retail dispensers, as a separate consideration, and their relative merit without temperature correction.

In Hawaii we have maintained for five years with no difficulty 2½ cubic inches new and 5 cubic inches maintenance on all dispensers, and Oregon has done the same for a lot longer period. Our data indicates that we could easily maintain 2 cubic inches new and 4 maintenance. It is interesting to note that if we fill 55-gallon drums on scales that we are compelled to hold the tolerance to 0.10 percent new and 0.2 percent maintenance, we are compelled to ask why, then, should pumps be accorded such a loose tolerance (three times that of scales or 0.3 percent new and 0.6 percent maintenance) in these days of such high-priced gasoline and advanced technology.

We suggest that what may have been applicable to devices such as those in figures 6, 7, and 8, when gasoline sold for 15 cents a gallon 35 to 40 years ago, are no longer applicable in our

FIGURE 6

FIGURE 7

FIGURE 8

current market. We suggest that consideration be given to amending the Liquid Measuring Device Code in this regard to require that the tolerances be more comparable to those for gravimetric devices, such as 1.5 cubic inches new and 3.0 cubic inches maintenance. These double tolerances represent 0.13 percent new and 0.26 percent maintenance so they are still not as tight as we now require for scales.

When you consider that under the existing Liquid Measuring Device Code a change in product temperature of 10°F will throw the delivery of 5 U.S. petroleum gallons beyond legal tolerance for in-service devices and as little as 5°F will throw the delivery of 5 U.S. petroleum gallons beyond legal tolerance for new devices, you can readily see how the "why" in "Why Temperature Correction?" becomes obvious.

After we made this presentation to our legislature, they unanimously enacted into statute law Act 239, which the Governor signed on June 14, 1974. It mandates temperature correction on all petroleum product transactions, whether public or private, and ratifies the actions of the Division of Weights and Measures taken three years earlier. We trust that this Conference will concur in the action of the Hawaii legislature and amend the Liquid Measuring Device Code accordingly and, barring this, to at least provide for the permissive application of temperature

correction to the benefit of the retailer and the consumer. Only then will you have assured "That Equity Shall Prevail."

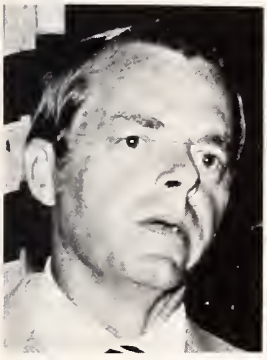
You have seen the general approach we have pursued in Hawaii. Some of you will, no doubt, consider it unnecessary for your jurisdiction. We believe that to be your decision. Again, there may be other jurisdictions similar enough to ours where this approach could be employed beneficially just as provided in Handbook 44 for LPG liquid, LPG vapor, and the proposed cryogenic codes.

We think Handbook 44 should be amended to permit and guide those jurisdictions that desire to temperature correct so as to assure optimum uniformity.

(Mr. Mattimoe showed approximately 200 slides. Only a small portion of that number has been reproduced here with his presentation.)

TEMPERATURE CORRECTION OF PETROLEUM PRODUCTS AT RETAIL

by HAROLD E. HARRIS, Engineering Coordinator,
Exxon Company, U.S.A., Houston, Texas



A rather intensive investigation by the American Petroleum Institute (API) into the relationship between temperature and retail sales of motor fuel in the United States proves that it is the consumer who benefits from the present practice of selling without temperature compensation.

In the next 25 minutes, we will show you how we conducted our investigation, the results of which are summarized in figure 1. We will show that 68 percent of the total motor fuel volume in the United States is consumed geographically above the 60°F ambient isotherm with 32 percent consumed below. We will also show that the overall average gallon of motor fuel is sold at 56.2°F (not 60°F) which provides an advantage to the overall American consumer of some 228 million gallons annually.

Immediately after the January 1974 interim meeting of the National Conference on Weights and Measures, an API Task Force was established with two primary objectives:

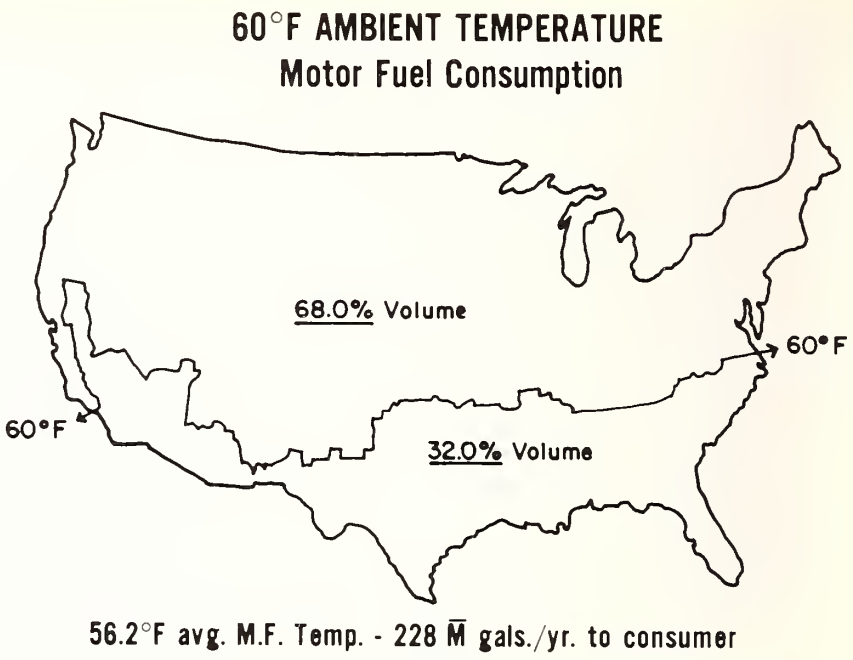


FIGURE 1

1. Investigate the validity of the claim made by the State of Hawaii that 60 percent of the retail gasoline sold at retail in the United States was sold at short measure or at temperatures exceeding 60°F.
2. Completely analyze the temperature effect on gasoline sold at retail.

This subject has arisen in the past, however, primarily with regard to potential dealer losses relative to amount delivered versus amount sold to the consumer. One of the most prominent cases occurred in the State of Texas in 1954–55. A very comprehensive survey was performed, and the results were documented in the July 1962 Congressional Record. Sixty retail outlets were involved and supplied a total of some 127,000 transactions. The conclusion drawn was that for every 1,000 gallons delivered to the retail dealer, he actually sold 998. This 0.2 of 1 percent is well within the required tolerance of a new retail meter. It was proven that the 60°F base was entirely equitable.

The results of surveys such as this have historically borne out the petroleum industry's contention that temperature effect is

not really significant as it will balance out for the overall consumer. (It is worthwhile to note that most of the State of Texas lies geographically south of the 60°F isotherm.)

Before proceeding with the detailed analysis of temperature effect, we perhaps need to address the question of present in-house use of temperature compensation by some petroleum companies.

Stated very simply, temperature adjustment is utilized for purposes of overall stock control. Also a tight inventory control system is a necessity in order to fulfill our responsibility for pollution control and safety. Due to the large volumes involved, utilization of many modes of transportation, long distances encountered, and storage in above-ground vessels, very significant changes in temperature can be encountered and make temperature adjustment necessary. Generally, these adjustments are made on a manual basis.

We will now turn to our analysis of the State of Hawaii study. Because the API investigation follows a very similar path to the one taken in the Hawaii study, we believe that we should explain why we have arrived at different conclusions. We certainly have no argument with the basic concern relative to temperature adjustment or of the established operating criterion: The base for petroleum measurement in the U.S. is a 231 cubic inch gallon at 60°F and 58 API gravity and gasoline volume does change at the rate of 6 to the minus 4 power per degree of temperature change. The task force agreed that the location of the 60°F ambient isotherm was a fundamental factor.

In figure 2 we see the thirty-year ambient isotherm as presented by the State of Hawaii which is based on data for the period during 1899 to 1938. While this may represent the 60°F line for that period, our research has uncovered more recent data (1942–1972) compiled by the U.S. Weather Bureau that describes a somewhat different isotherm.

As you can see in figure 3, the isotherm has moved from south to north or from warm to cool, which tends to enhance the State of Hawaii's position.

As we understand it, the next step taken by the State of Hawaii utilized API data to determine the seasonal variation in driving by the American consumer. All data was taken from the 1971 volume of "API Petroleum Facts & Figures." The data in figure 4 is for the year 1969, but is quite representative of any one-year period in the last fifteen years.

The average motorist drove 5,280 miles in the warm season and 4,314 in the cool season, or 966 miles more while it was warm. (This is not to say that warm versus cool is the same as above or

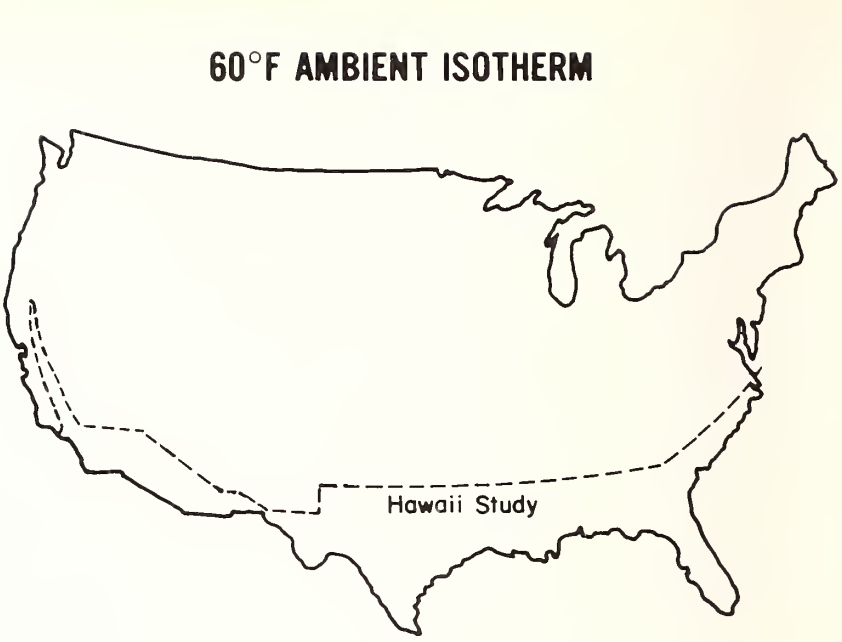


FIGURE 2

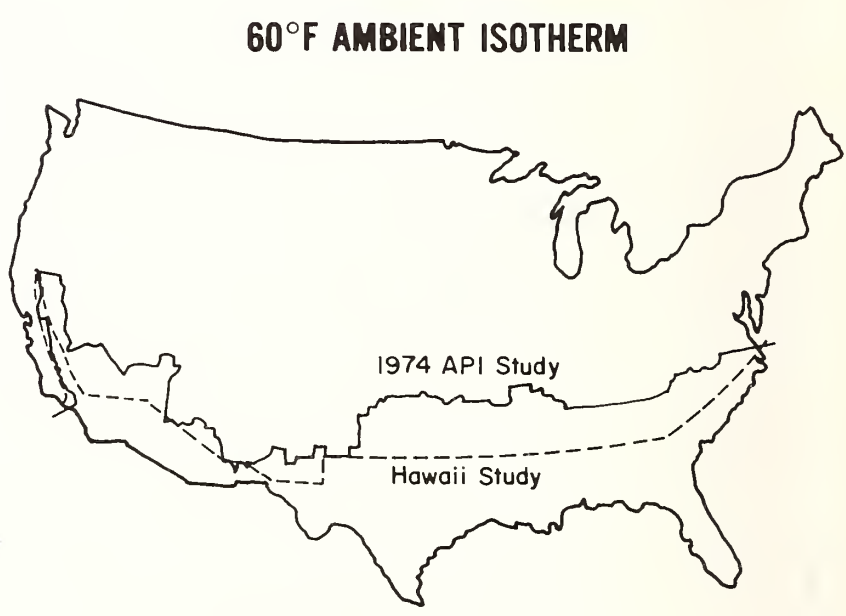


FIGURE 3

below 60°F.) The average auto consumed 13.75 miles per gallon, utilizing 700 gallons annually. A calculation is then made by dividing the warm season differential mileage by annual consumption at 10.06 percent.

STATE OF HAWAII STUDY

DATA BASE (FROM API PETROLEUM FACTS & FIGURES)

- MILES DRIVEN BY AVERAGE MOTORIST
  - 5,280 WARM SEASON (Δ = 966)
  - 4,314 COOL SEASON
    9,594
- AVERAGE AUTO CONSUMPTION
  - 13.75 MILES/GALLON
  - 700 GALLONS ANNUALLY

CALCULATION

$$\frac{996 \text{ MILES}}{13.75 \text{ m.p.g.}} \; / \; 700 \text{ GAL.} \; = 10.06\%$$

FIGURE 4

A conclusion was then drawn (assuming that a fifty/fifty distribution of motor fuel purchases above/below the 60°F isotherm exists) utilizing:

- The 10.06 percent calculated as a warm season factor was then stated as delivered short measure.
- Further, the 10.06 percent is additive to the 50 percent short (assuming a fifty/fifty distribution) and 60.06 percent of all gasoline delivered at retail is delivered short measure.

Here we find an error in statistical logic:

State of Hawaii Study
Statistical Error

− 100 percent consumed minus 10 percent equals 90 percent remaining, therefore, 10 percent is additive to 45 percent.
+ 55 percent of all gasoline delivered is consumed during the warm season.

Taking 100 percent consumed minus 10.06 percent (10 percent for ease), there can be only a total of 90 percent remaining. Therefore, assuming a fifty/fifty distribution, the 10 percent is additive to only 45 percent. A true conclusion can be drawn that 55 percent of all gasoline delivered is consumed during the warm season (again, this is not to say above 60°F).

This may be rather confusing, so let us look at the same data from a different approach by returning to figure 4 showing the 10.06 percent calculation. Looking specifically at two pieces of this data—5,280 miles driven during the warm season of a total of 9,594 miles driven—enables us to make a direct calculation as shown at the bottom of figure 5. The 5,280 miles driven in the warm season is divided by the 9,594 total miles driven. This equals 55 percent driven in the warm season, which checks with our analysis.

STATE OF HAWAII STUDY

ERROR

- 100% CONSUMED MINUS 10% = 90% REMAINING, THEREFORE, 10% IS ADDITIVE TO 45%

+ 55% OF ALL GASOLINE DELIVERED IS CONSUMED DURING THE WARM SEASON.

5280 MILES DRIVEN (WARM SEASON)
9594 TOTAL ANNUAL MILES DRIVEN

55.0%

FIGURE 5

Since this was the key point in the State of Hawaii study, we decided to look at the seasonal driving factor historically. (See figure 6.) The published warm versus cool season data actually depicts fall/winter versus spring/summer, or September 23 to March 20 and March 21 to September 22. Looking at the last 17 years, we see an average 45 percent fall/winter (or cool) consumption and an average 55 percent spring/summer (warm) consumption. The 1968–69 data highlighted is that used in the Hawaii study.

STATE OF HAWAII STUDY
TEMPERATURE COMPENSATION STUDY

SEASONAL DRIVING FACTOR

YEAR 19__	SEASON (MILES) F/W	S/S	GASOLINE CONSUMPTION %
55-56	3952	5030	44/56
60-61	4323	5265	45/55
65-66	4230	5170	45/55
68-69	4314	5280	45/55
72-73	4500	5500	45/55

AVERAGE 55% - WARM SEASON

FIGURE 6

The task force also noted another error, one of data selection. A total annual gallonage consumed of 62.5 billion was elected. Essentially, this gallonage included automobiles only and excluded gasoline consumed by such vehicles as motor trucks and commercial/school buses. The actual annual gallonage consumed relative to the 62.5 billion (which is for 1969) was some 88.1 billion gallons. After this 41 percent differential is taken into account, the 55 percent consumption in the warm season changes to 53.5 percent.

While all of the preceding has a bearing upon the magnitude of the imbalance between warm and cool season sales, it still shows the consumer coming out on the short end. This would be true if it were not for the most serious error in the Hawaii study—an error in assumption: A normal fifty/fifty distribution of motor fuel purchases above and below the 60°F isotherm exists. We will discuss this point in more detail later.

After this review of the Hawaii study, the API task force commenced its own study of temperature versus product consumed. As you will see, it was determined that the American consumer benefits from present retail practices.

Believing that distribution of sales, as they relate to the average 60°F ambient isotherm, to be the key factor in any analysis to be made, we established our study objectives:

- Establish accurately the average 60°F ambient isotherm.
- Determine the motor fuel volume and temperature above and below this 60°F isotherm. With this data we can then determine the average degree-gallon, i.e., temperature times consumption.
- Then we can determine the average temperature of the total motor fuel volume.
- It also seemed appropriate to look at present trends to determine the future direction and rate of change.

The data input that was available was determined:

- (1971) API Petroleum Facts & Figures
- API compilation of 1972 motor fuel sales volume by state/month
- Automobile registration data by county and by state
- U.S. Department of Commerce Weather Data—1972 summary
- National Petroleum News "Factbook" (1970–1974)
- Industry temperature survey data

As previously mentioned, the establishment of the 60°F ambient isotherm is fundamental.

Input data was obtained from the U.S. Department of Commerce. Actual 1972 data from some 6,050 weather stations was compiled and adjusted for the 30-year period of 1942–72. The approach chosen was one of a weighted geographical average.

After establishment of the isotherm we next attempted to determine the relationship between ambient temperature and underground product temperature. The State of Hawaii concluded that the average temperature of motor fuel product in underground tankage is equivalent to the average ambient temperature. Data available on this subject is very limited. The assumption made may or may not be correct for any individual location, but probably will be reasonably close overall due to a balancing effect.

After considerable study of all available data, the task force determined that this basic asssumption should be utilized.

We should point out that effort is continually being made to learn more about the nature and behavior of petroleum products. As part of a vapor emissions project, an API task force is presently conducting a very comprehensive temperature survey. Continuous temperatures of motor fuel are measured within the underground tank and near the dispensing nozzle. This will certainly give us a better understanding of this subject; however,

unfortunately, the final test results will not be known until mid-1975.

API has recently entered into a $500,000 program at the National Bureau of Standards related to developing information about the physical properties of petroleum products. Also, most of you are aware of the Research Associate project which has been going on for the past three years. This project, funded by API and under the supervision of the Office of Weights and Measures, is directed towards establishing better proving procedures which will be of value to both industry and the regulatory officials.

Turning again to the 60°F ambient isotherm, we utilized the line that reflects 1942 to 1972 data. (See figure 7.) We divided the United States into three geographic categories:

1. Above the 60°F isotherm
2. Divided by the 60°F isotherm
3. Below the 60°F isotherm

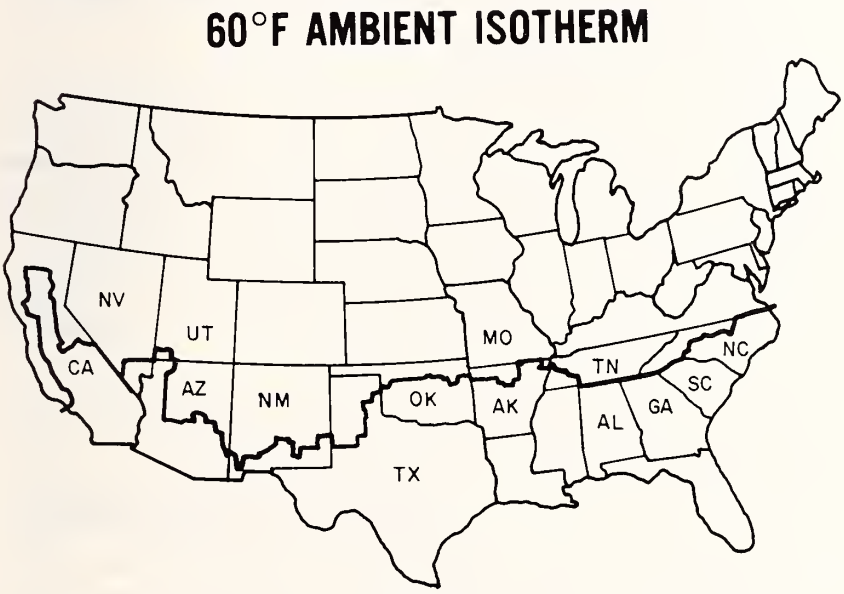


FIGURE 7

Each category was handled separately in our statistical analysis.

First, looking at the approach to the states either completely above or completely below the isotherm:

- The total product sold in 1972 was determined on a monthly basis.

- The average ambient temperature was determined on a monthly basis.
- The product of the two quantities (gallons and degrees) gives the degree-gallon determination.
- By totaling the degree-gallons for a year's period and dividing by the yearly product sold, we determine the "weighted average product temperature," i.e., the average temperature at which the product was issued.

For those states divided by the isotherm, one additional item had to be utilized: vehicle registration by county.

Since monthly gallonage figures are generally available only by state total, vehicle registration by county was used to determine the division of sales between two areas. The remainder of the analysis was made in the same manner as for those states completely above or below the isotherm, i.e., total monthly product sales times the average monthly ambient temperature equals the degree-gallons, and weighted average product temperature can be determined. Perhaps an example would assist in a better understanding of the overall approach that was taken:

In figure 8 we show the State of Arizona with the 60°F isotherm dividing the State. The dots shown represent some 200 weather bureau stations. The monthly average from each of these stations was utilized to calculate yearly average temperature of weather divisions. These numbers shown, ranging from a low of 51.6°F to a high of 71.5°F, illustrate the extreme variations in temperatures geographically. Though we show yearly averages here, our motor fuel consumption calculations utilized monthly data as you will see later.

Figure 9 shows the State of Arizona divided by counties and again locates the 60°F ambient isotherm. The numbers indicate the percentage distribution of automobile registration. As previously stated, this allows us to estimate the motor fuel volume consumed by county above and below the isotherm. We have determined the "zoned" average monthly ambient temperature below and above the 60°F ambient isotherm or warm/cool. Also, we have determined the monthly motor fuel consumption by zones.

The calculations (figure 10) then consist of the summation by month by zone of the multiplication of the average monthly temperature times the monthly motor fuel consumed. We then obtain degree-gallons of 68,741,000,000 and 2,727,000,000.

The weighted average temperature can then be determined by dividing the total degree-gallons by the total gallons consumed.

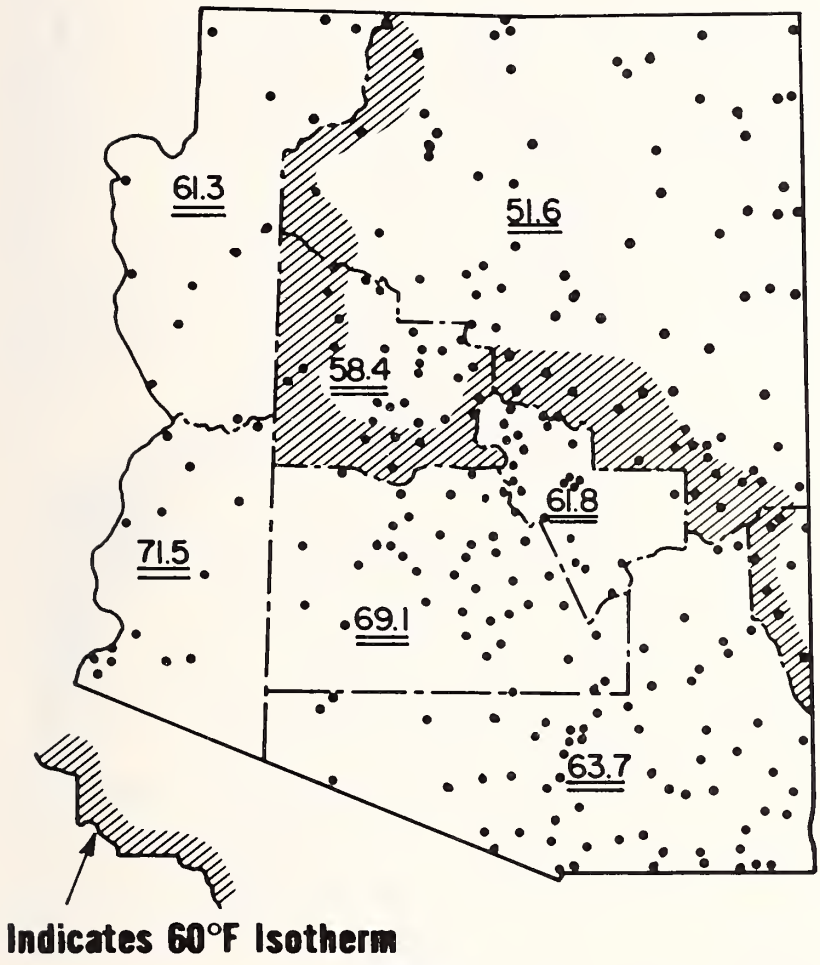


FIGURE 8

This was determined as 65.8°F in the warm zone and 55.4°F for the cool zone.

The conclusion relative to temperature effect on retail motor fuel product in the State of Arizona can then be stated:

Warm Zone: One billion, 45 million gallons of motor fuel were consumed at an average temperature of 65.8°F.

Cool Zone: Forty-nine million gallons of motor fuel were consumed at an average temperature of 55.4°F.

ARIZONA

Automobile Registration (percentage)

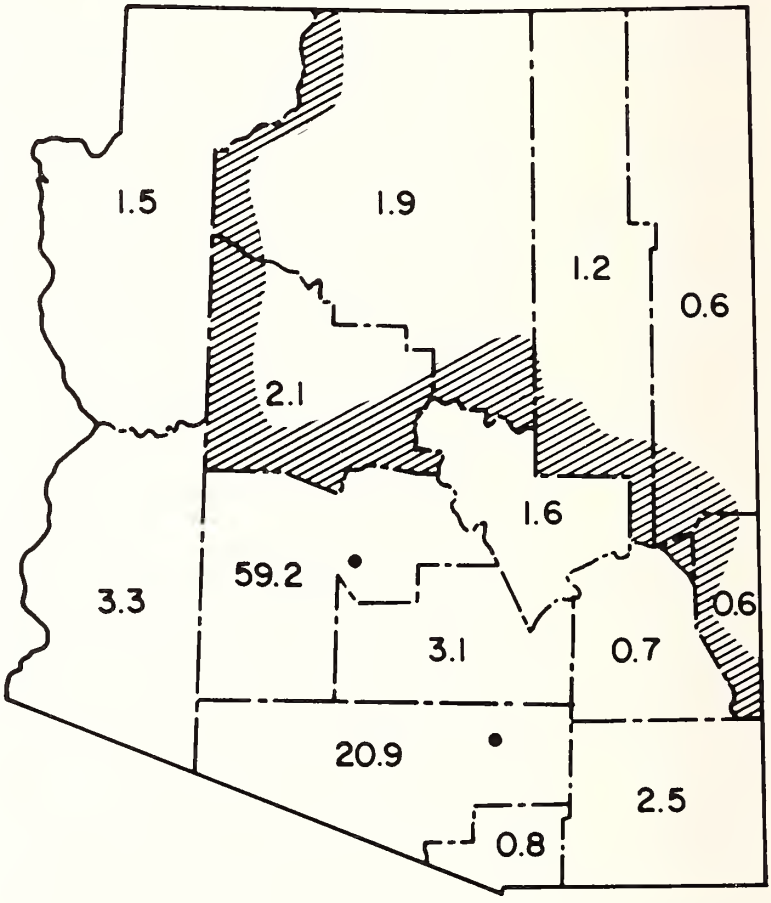


FIGURE 9

MONTH

[AVERAGE AMB. TEMP. x M.F. CONSUMED] = DEGREE-GAL.

ZONE

WARM ZONE 68,741 DEGREE - $\overline{M}$ GAL.

COOL ZONE 2,727 DEGREE - $\overline{M}$ GAL.

FIGURE 10

The examples just given illustrate our approach to all states divided by the isotherm. States completely above or below the isotherm were treated generally in the same manner with the exception that it was not necessary to utilize car registration by county to estimate the volume of motor fuel consumed.

In figure 11 let us now look at the results of these calculations on a nationwide basis. We see the three major state categories—below, above, and divided—as well as the warm and cool subdivisions of the divided states. States below have an average ambient of 66.6°F, 12 billion, 914 million gallons are consumed, or 12.9 percent of total U.S., all at a temperature of 67.5°F. Above the isotherm is where we see the large impact of the average ambient temperature being below 60°F with gasoline consumption being 60.1 percent of the total. States divided by the isotherm have an average ambient temperature of 62.7°F warm and 55.0°F cool, with product consumed at an average of 64.4°F warm and 56.9°F cool.

API TEMPERATURE COMPENSATION STUDY

ALL STATES

	AVE.AMB. (°F.)	M.F. CONSUMED ($\overline{M}$ GALS.)	%	TEMP(°F.)
BELOW ISOTHERM (WARM)	66.6	12,914	12.9	67.5
ABOVE ISOTHERM (COOL)	48.5	60,123	60.1	50.8
DIVIDED BY ISOTHERM				
WARM	62.7	19,097	19.1	64.4
COOL	55.0	7,935	7.9	56.9
TOTAL		100,070		56.2

FIGURE 11

Showing this in another manner (figure 12) and taking into account all 50 states, we see that:

- Sixty-eight percent of all motor fuel representing 68 billion gallons is consumed geographically above the 60°F ambient isotherm, whereas 32 percent is consumed geographically below.
- The average gallon of motor fuel sold at retail is sold at 56.2°F (not 60°F) and the advantage is to the overall American consumer, by some 228 million gallons annually.

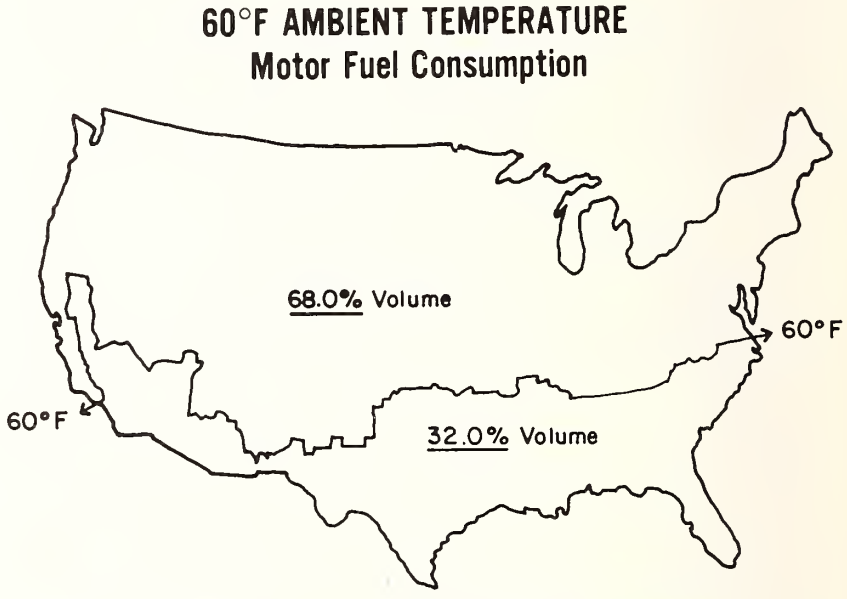


FIGURE 12

As you will recall, the final objective of the API task force was to look at current trends and attempt to determine the future direction and rate of change. The following are noted trends:

- The 60°F ambient isotherm is moving from south to north.
- The distribution of motor fuel consumption is moving from north to south.
- The travel factor (warm versus cool) is remaining constant.

Also, as previously discussed, additional data relative to actual dispensed product temperature is needed.

Taking these trends into account, we have attempted to forecast the potential for the justification of temperature compensation at the retail level. If the current trend of dispensed product "warming" is projected into the future, it appears that by about 1985 a new study of temperature compensation should be made. We would recommend that this be a joint effort of API and the National Conference on Weights and Measures.

The API task force also looked at other aspects, including the potential impact on the marketplace, of requiring temperature compensation at retail. The following are their considerations:

API TEMPERATURE COMPENSATION STUDY

- Motor fuel volume change due to temperature favors the consumer.
- Temperature compensation would not be cost effective to the consumer. Based on the procedures outlined by the State of Hawaii, to manually compensate until such time as automatic equipment could be developed and installed might well result in a total cost of some $700 million. The consumer would lose rather than benefit.
- If true equity is to prevail for the overall consumer, then temperature compensation should not be selective by geographical area or by petroleum product.
- Equitable manual compensation is virtually impossible and automatic equipment is not presently available. Our analysis of Weather Bureau data revealed a very wide variation from thirty-year normal for many monthly average temperatures. It appears that a year is the smallest element of time where average temperatures will reflect the long-term normal.
- If it is determined that retail motor fuel sales are to be temperature compensated, it will be necessary to make temperature adjustments throughout the complete distribution chain.

There is one additional factor we need to consider; and while last, it is perhaps the most significant of all:

- Since competition and cost of doing business determine the price of products in the marketplace, the pricing structure for retail sales reflects loss or gain of product.

In the presentation that you have just heard, we have attempted to point out the logic and facts concerning temperature correction

of petroleum products at retail and have proven that the American consumer benefits from the present practices.

In conclusion, the American Petroleum Institute recommends to the National Conference on Weights and Measures that temperature compensation at retail should not be mandatory nor selective geographically.

DISCUSSION

UNIDENTIFIED VOICE: I have a question for Mr. Harris. I was kind of interested in that isotherm of 60 degrees that you discussed. That isotherm was actually based on atmospheric conditions as I recall, was it not? Actually, it does not really reflect the temperature of the gasoline that is stored in the ground. It seems to me there is a significant difference in temperature between actually what is on the outside and what the temperature of the gasoline is stored in the ground. I would suspect that the temperature of the gasoline in the underground tanks is actually less than what your isotherm actually is. The temperature going into the tank of the car is probably less than what your isotherm is. Am I correct?

MR. H. HARRIS (Exxon Company, U.S.A.): Yes and no. It is a very good point and, if you remember in our study, the one point that we had to make an assumption. We finally agreed with the assumption that Mr. Mattimoe had made that ambient was equivalent to underground tank temperature. I think it probably is but, again, on an overall averaging basis what you are saying can be exactly true in one area, whereas you can go just a few miles perhaps into a different type of underground strata and have just the reverse happen. It is something we, frankly, just do not know that much about to pinpoint it that accurately.

MR. G. E. MATTIMOE (Hawaii): Might I add a thought to that? I agree with Harold 100 percent. It was an extremely difficult problem to come up with information relative to (1) the underground temperature in a given locale and (2) the heat transfer after the product was put into the tank in that underground locale. The University has done a great deal of study on the effect of heating the heat diffusivity, if you will, under black polyethylene and its effect at given depths. It was concluded by a professor at the University that at about three metres in depth the temperature approaches that of the mean average—of the mean average at 60 inches in height.

Why did we use two different systems of measurement? Apparently the Weather Service at one time set its little white boxes about five feet off the ground. I do not think there is any-

one in this room or perhaps anyone in any university who could categorically say precisely what the temperature was three feet underground. It was an approximation, and in this instance we did not differ.

MR. M. KINLAW (North Carolina): We failed here to mention that Handbook 44 does not now contain one single syllable that prohibits a person from using a temperature compensator if he wishes to do so at retail level. Another thing we failed to mention is that the Constitution of the United States delegated to Congress the authority to fix the standards by which goods are bought and sold in this country and in almost the same breath it also gave it the authority to coin money. I think if you use the temperature compensator, that is still within the meaning of what Congress is doing because a gallon is 231 cubic inches and it updates it constantly; but if you set it manually different than that, you have set a standard different than Congress set. By the same logic, the state could also coin money, if we follow that.

MR. M. TRUJILLO (Puerto Rico): Mr. Harris, is there direct opposition to amending Handbook 44 to make permissive temperature correction?

MR. HARRIS: If I understand your question correctly, the objection would be permitting selectivity.

MR. KINLAW: It is already permissible in the handbook. There is not one single syllable that prohibits it; if a temperature compensator is available. I think what it does not want to do is to have you set a gallon different from 231 cubic inches because that would be unconstitutional.

MR. TRUJILLO: If I understood correctly, Mr. Mattimoe said the standard that has been approved by Congress was a U.S. gallon at a particular temperature. If that is the standard, then what is being done now is unconstitutional because it is a particular volume not at a particular temperature. I would like to know what the facts are regarding the particular standard established by Congress.

MR. MATTIMOE: What we have had generated we attempted to show on the chart dating back to about 1912 through 1917. The Bureau entered into a cooperative program whereby they investigated a multitude of North American crudes. They came up with a plurality of dots which are included in this white book. From that they decided various thermal coefficients of expansion for various density petroleum products. It has subsequently been determined that these tables may not be correct for the current crudes that originate throughout the world.

Of a consequence, API, as I understand it, has now entered into a program of one-half million dollars to have the Bureau

update these tables. Although there will probably be changes in the coefficients or correction factors for crudes, there probably will be minimal changes in the correction factors for the finished products. That fact notwithstanding, the basic unit described is 231 cubic inches at 60 degrees. That was established not by Congress but by apparent agreement with England.

The statutory requirement for 231 at 60 degrees prevails, but it prevails under FPLA and it relates to packaged products. Therefore, any extension from 231 to 60 degrees relating to packaged products gives us two standards, two different size gallons, if you will. It would merely be a logical extension of any 231/60 throughout the whole hierarchy and that is what we suggest.

MR. TRUJILLO: Mr. Harris, due to the fact that you apparently cannot temperature correct because of the devices for pumping out gasoline throughout the Nation, you are well aware that we are under mandatory price regulations by the Federal Energy Administration. Would the petroleum industry be willing to temperature compensate their prices? They do change the prices every month taking into account cost factors. They can put into their computer the prevailing temperature of the particular zone. I think the electronic people can work wonders with the computers; how about compensating the price instead of the pump?

MR. HARRIS: I certainly cannot answer that question directly for the petroleum industry, but it goes back to a point that we made. If you are in a competitive society or competitive market, the cost of doing business actually determines the price of products in that marketplace. Any loss or gain in product is automatically taken into account in that pricing structure which is saying essentially the same thing, I guess, that you were asking; but it is saying it already is there.

Going back to your previous question, one other point relative to states that are completely south of the isotherm—one other point other than the competition in the marketplace—is that generally, and I believe probably for all states, it would not be cost effective. I am certain that on a manual adjustment basis trying to adjust monthly would not be cost effective. Putting it another way, the cost benefit ratio is just not there.

MR. TRUJILLO: You are assuming for purposes of your study that the petroleum industry is a fully competitive industry within the terms that the economists consider as competition or nearing perfect competition. That is the assumption?

MR. HARRIS: That is correct. Going back to your 1972 price control, since everything is based on 1972 and it was competitive in 1972, it stays competitive.

REPORTS OF STANDING COMMITTEES

REPORT OF THE COMMITTEE ON LIAISON WITH THE FEDERAL GOVERNMENT

Presented by L. D. Holloway, *Chairman*, Supervisor, Division of Weights and Measures, Department of Agriculture, Boise, Idaho

(Wednesday, July 10, 1974)

The Committee on Liaison with the Federal Government submits its report to the 59th National Conference on Weights and Measures. The report consists of the tentative report as offered in the Conference Announcement and as amended by the final report. Also included as an attachment is the report of the Committee on Metric Planning.

The report represents recommendations of the committee formed on the basis of careful analysis of the interim meeting discussion, written comments received during the year, and oral presentations made during the open meeting of the committee. The committee intends to expand its communications with the Federal Government and to advocate the NCWM's interests before it. The committee also intends to promote greater Federal-State-local government cooperation towards attaining one of our common goals—measurement assursance in the marketplace.

METRIC CONVERSION

The Liaison Committee was instructed by vote of the 58th National Conference on Weights and Measures (NCWM) to commence immediately in preparing plans for a rational and orderly national conversion to the metric system of weights and measures. This action was taken because of the increasing use of the metric system throughout the United States by industries, educational institutions, and state and local government.

Federal legislation for metric conversion has been moving forward and its passage will bear heavily on the responsibilities and programs of weights and measures officials and the work and goals of NCWM. A national planning and coordinating board will be created by the passage of a metric conversion act for the

purpose of leading and guiding the changeover throughout the nation. It is, therefore, important that the National Conference be prepared to assist the national conversion board and to properly represent the interests of the NCWM membership in all metrication activities.

On the basis of its own recommendation and to facilitate immediate action that was determined to be advisable, the Conference Executive Secretary designated the Liaison Committee to serve as the nucleus of a new special committee of NCWM to be entitled "Committee on Metric Planning." This special committee will be formally set up according to the published Organization and Procedure of the Conference. The essential features of its organizational structure are as follows:

1. *Membership*—The committee shall be comprised of the five active members of the Committee on Liaison with the Federal Government and the following three state weights and measures directors: Mr. George L. Johnson (Kentucky), Mr. John H. Lewis (Washington), Mr. George E. Matttimoe (Hawaii). Other members may be added as the need or circumstances require.

2. *Duration*—The committee will serve for a period not to exceed two years. At the end of that time, a decision will be made as to its future organization and role in the NCWM.

3. *Liaison*—The three state directors will be responsible for and provide liaison betweeen the other three standing committees of the Conference.

The committee acknowledges the statement by Mr. Maximiliano Trujillo, Puerto Rico, that the responsibility for rational conversion to the International System of Units, without Federal legislation, appears to rest with the state jurisdictions of weights and measures. The committee acknowledges the receipt of a draft of model state metrication legislation from Mr. Trujillo with his suggestions (1) that the National Conference on Weights and Measures consider adopting such a type of legislation, and (2) that the states help the Office of Weights and Measures draft metric versions of the handbooks. The committee also acknowledges the suggestion by Mr. Henry Thompson, Virgin Islands, that if certain of the handbooks are converted to metric, versions should be published in both English and Spanish.

Further reports on metric conversion will be isssued by the Committee on Metric Planning.

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

The United States gained membership in the International Organization of Legal Metrology (OIML) in August of 1972. This action was taken to improve opportunities for exporting measurement instruments and to influence internationally adopted measurement techniques so that U.S. products and practices would not be put at a disadvantage. The Department of Commerce was assigned general responsibility for program implementation and direction. Within Commerce, the National Bureau of Standards (NBS) was assigned responsibility for the development of U.S. positions for technical matters arising in OIML. The mechanism for establishing U.S. positions is extremely important in that consideration must be given to both the technical and commercial consequences of international recommendations.

A report on the latest developments concerning OIML was presented to the committee by Mr. David E. Edgerly, Special Assistant for International Programs, NBS. It was reported that the charter for an Advisory Committee on International Legal Metrology was going through Government channels and that the committee should be given official status in the very near future. (Note: The committee was formally chartered on March 20, 1974.) Following the establishment of the Advisory Committee which will be composed of representatives of industry, Government, and national standards bodies, a meeting will be called to elect officers, adopt by-laws, name technical advisers for secretariats, and develop national and international technical working groups.

The committee was advised that NBS representatives who attended meetings of the International Committee on Legal Metrology in Paris, France during October of 1973 were successful in achieving several major goals, including the assignment of seven secretariats (5 pilot and 2 reporting). This assures active participation by the United States in OIML, for this country now holds more pilot secretariats than any other country. The following is an up-to-date report on OIML matters presented during the Conference by Mr. James F. Lyles, State of Virginia, who serves as the NCWM representative on the U.S. Advisory Committtee on OIML.

The United States Advisory Committee for International Legal Metrology was formally chartered March 20, 1974. Mr. William E. Andrus, Jr. of the National Bureau of Standards is committee chairman; Mr. David E. Edgerly of NBS is committee secretary. At its first official meeting on April 22 and 23, 1974, the commit-

tee, composed of both industry representatives and government officials, reviewed and revised the Charter and By-laws, heard status reports on U.S.-held pilot secretariats in OIML, and discussed other OIML activities in which the U.S. might involve itself.

The U.S. has accepted five pilot secretariats:

P.S. 7	Measure of Masses
P.S. 8	Weights
P.S. 13	Measure of Electrical and Magnetic Quantities
P.S. 17	Measure of Pollution
P.S. 22	General Principles of Inspection of Measuring Instruments

Both the United States and Germany expressed interest in accepting the pilot secretariat for the "Measure of Liquid Hydrocarbons." However, there are currently no provisions for resolving such a situation in the OIML procedures. Since only one nation can hold a given pilot secretariat, no country presently holds this particular one.

Under each pilot secretariat, reporting secretariats carry out the work plan which the pilot secretariat formulates. However, since many working groups of the reporting secretariats antedate the pilot secretariats, all the international recommendations and other work which has been accomplished up to this date have not had explicit objectives or work plans by which to operate.

The U.S. Advisory Committee also considered other areas in which the United States might wish to take an active role, either accepting a reporting secretariat or membership in working groups which are part of reporting secretariats chaired by other countries. Suggested areas were:

General Legal Metrology
Judicial and Administrative Questions
Measures of Liquid Volume
Measures of Gas Volume
Measures of Density
Measuring Instruments for Automotive Vehicles
Packaged Products
Measuring Instruments Used for Public Health

The Office of Weights and Measures, NBS, acts as technical adviser on Pilot Secretariat 7 and, with the NBS Institute for Basic Standards, acts as technical adviser on P.S. 8 and 22 as well.

In these areas, the Office of Weights and Measures has formed a national working group for P.S. 7, "Measure of Masses," composed of Mr. Marion L. Kinlaw, Division of Weights and Measures, North Carolina; Mr. Lacy H. DeGrange, Division of Inspection and Regulation, Maryland; Mr. Robert Bradley, Toledo Scale; Mr. Charles Knodel, Fairbanks Weighing Division of Colt Industries; Mr. Bernard Shapiro, BLH; Mr. John Aquadro, Howe Richardson Scale Company; Mr. Otto K. Warnlof, Office of Weights and Measures, NBS; and Mr. Harold F. Wollin, Office of Weights and Measures, NBS. This working group has formulated a work plan which will be submitted for review to OIML. A second national working group has been formed for P.S. 22, "General Principles of Inspection of Measuring Instruments."

On May 21–23, 1974, Mr. Otto K. Warnlof attended a meeting of an OIML working group whose reporting secretariat (held by the United Kingdom) is under Pilot Secretariat 7. Document 19, "Fourth Draft—International Recommendation on Automatic Weighing Machines—Continuous Totalizing Weighing Machines," containing design, performance, and use requirements for belt conveyor scales, was discussed. As soon as the new draft based on this meeting is sent from the United Kingdom, it will be circulated to U.S. manufacturers, and a meeting will be held to develop a consensus.

In its tentative report to the 59th NCWM, the Committee on Liaison with the Federal Government wishes to define the limit of moral obligation that the NCWM is willing to accept in regard to model regulations recommended by the OIML. The committee's proposed resolution was presented to the U.S. Advisory Committee for International Legal Metrology. Since this resolution would be the first of its kind, in that it would explicitly define our obligations to OIML, Mr. Andrus asked that the resolution be formally transmitted to him if the NCWM approved the tentative report on OIML. He would then read this statement from the NCWM before the next meeting of the OIML.

The United States has accepted tremendous responsibility in the OIML; and it will take a concerted effort on the part of the NCWM to fulfill our national obligation.

The Liaison Committee proposes the following resolution for the consideration of the Resolutions Committee of the National Conference:

Whereas the purpose of this resolution is to define the limit of moral obligation that the National Conference on Weights and Measures is willing to accept with regard to model regulations promulgated by the International Organization of Legal Metrology (OIML); and

Whereas it is the recommendation of the Committee on Liaison with the Federal Government of the National Conference on Weights and Measures that this Conference should implement only those model regulations in which the National Conference on Weights and Measures has, through active review and ultimate acceptance, agreed with the technical content of each proposed regulation or document: Therefore be it

Resolved, That it is an established policy of the National Conference on Weights and Measures that it will not consider itself morally obligated to adopt, promote, or domestically implement an official OIML model regulation until such time as (first) the NCWM agrees that the U.S. should cast an affirmative vote and (second) that the U.S. has cast that vote on behalf of the model regulation under consideration in the International Conference of OIML.

OTHER ITEMS

1. The committee received a memorandum from Mr. Louis Barbrow of the NBS Metric Information Office concerning action regarding metric conversion of measuring devices. The committee would like to refer this item to the Committee on Metric Planning for its consideration.

2. The committee acknowledges a request by Mr. S. D. Andrews, State of Florida, that it contact those federal agencies having authority in the area of packaging and labeling of imported prepackaged products and attempt to work with them on obtaining a consensus on methods and control regulations in this area.

3. The committee would like to acknowledge a statement by Mr. Ralph Barra of NBS. He has been assigned by Dr. Ernest Ambler, Deputy Director of NBS, the task of meshing necessary standards and other technical needs of state and local governments with those specialists who might help at NBS. It was his opinion that weights and measures jurisdictions might wish to get involved for one of two reasons: (1) The cooperative work of weights and measures regulatory officials with the Office of Weights and Measures of the NBS is a model of Federal-State-local government interaction towards a common goal. Therefore, weights and measures jurisdictions could very easily serve as advisers on any new working arrangements between state and local governments and NBS. (2) This may afford an opportunity for those weights and measures jurisdictions that wish to get involved, or are involved, in commercial measurements extending beyond classical mass, length, and volume, e.g., clinical thermometry, time measurements, or laboratory certification.

L. D. Holloway, *Chairman*, Idaho
A. Sanders, Scale Manufacturers Association

W. N. SEWARD, American Petroleum Institute
J. SPEER, Milk Industry Foundation
E. H. STADOLNIK, Massachusetts
C. S. BRICKENKAMP, *Staff Assistant*, NBS
H. F. WOLLIN, *Exec. Secy.*, NCWM

Committee on Liaison with the Federal Government

(Mr. Holloway moved for adoption and, after a second from the floor, the report of the Committee on Liaison with the Federal Government was adopted in its entirety by the Conference by voice vote.)

ATTACHMENT TO THE REPORT OF THE COMMITTEE ON LIAISON WITH THE FEDERAL GOVERNMENT

REPORT OF THE COMMITTEE ON METRIC PLANNING

Because industry and state and local governments of the United States are increasing their voluntary use of the metric system of weights and measures at an ever-expanding rate, the National Conference on Weights and Measures (NCWM), at the 58th Conference held last year, empowered its Committee on Liaison with the Federal Government to assess, evaluate, and plan for the impact of conversion to the metric system. The Liaison Committee was instructed to prepare advice needed to ensure a rational and orderly conversion.

In keeping with its responsibility and in conjunction with the Conference executive secretary, the Liaison Committee recommended that the Conference president designate a new special committee on metric planning which is comprised of the five active members of the Liaison Committee plus three additional state weights and measures officials. The committee respectfully requests that Mr. J. F. Lyles, representative to the U.S. Advisory Committee on International Legal Metrology, be included as an *ex officio* member of this special committee.

GOALS

Initial goals were established by the committee at the interim meetings early this year to provide coordination and establish policy in the following areas:

(a) State and local laws and regulations
(b) Federal requirements
(c) Weighing and measuring devices
(d) Packaging and labeling practices
(e) Physical standards and test methods
(f) Publications

It should be noted that advocacy of the International System (SI) of Units is another goal of the Metric Planning Committee.

WORK PLAN

Among the matters identified and discussed by the committee, the following were selected as the basis for an initial work plan:

(a) Analysis of state and local laws and regulations and determination of amendments to remove obstacles to metric conversion.
(b) Development and publication of metric companion versions of NBS Handbook 44 and other weights and measures publications.
(c) Modification of test equipment, standards, and procedures.
(d) Study and development of training programs for weights and measures officials and industry personnel.
(e) Specification of preferred units of weights and measures in commerce under the metric system.
(f) Coordination with federal agencies and with international standards organizations regarding regulations in the area of weights and measures.
(g) Promotion of educational material for consumers.
(h) Identification of weights and measures terms where soft conversion would be appropriate and, where permissive, hard conversion would represent an opportunity.
(i) Review of priorities for the changeover to the metric system and recommendation of timetables for such changes.

These items and initial strategies were selected primarily from papers submitted by Mr. Edward H. Stadolnik, Head Administrative Assistant, Executive Office of Consumer Affairs, Division of Standards, State of Massachusetts, and Mr. George E. Mattimoe, State Deputy Director of Weights and Measures, Department of Agriculture, State of Hawaii.

STATE ANALYSIS

The Mattimoe report included a study on state legislation to determine whether metric conversion was permissible in the various states. The study indicated that in thirty-eight of the jurisdictions (including Puerto Rico) the metric system is permissive. Six jurisdictions (including the District of Columbia) indicated that only the U.S. customary system is recognized. At the time of Mr. Mattimoe's report, eight states had not responded.

It was felt that the committee needed to learn more about our current state weights and measures systems in terms of the impact of metrication before this year's Conference, which was a little over a month away at the time of the decision. Although it was determined that only three man-weeks could be allocated to a followup to the Mattimoe effort (and, of course, the states would have very little time to respond), it was decided to go ahead.

The Conference executive secretary appointed a staff assistant to the Committee on Metric Planning with instructions to develop, with the highest priority, a metric inquiry. Its purpose would be to determine obstacles and suggest amendments relating to metrication and current state laws and regulations. A copy of the metric inquiry is presented below.

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

June 7, 1974

MEMORANDUM FOR State and Local Weights and Measures Officials

From: Terrance N. Troy
Staff Assistant
National Conference on Weights and Measures

Subject: Committee on Metric Planning—Request for Information

The National Conference on Weights and Measures is preparing plans for a rational and orderly conversion to the metric system of weights and measures. This action is necessary because metrication is accelerating and creating problems. These problems range from consumer confusion resulting from nonuniform metric-labeled packages to export barriers caused by our use of customary units which are increasingly unacceptable to the world market.

A special committee has been designated to carry forward the planning which is necessary to determine our objectives and priorities. This Committee on Metric Planning needs to learn more about our current state weights and measures systems in terms of the impact of metrication. We are therefore asking that an analysis be made, with legal assistance if possible, of your State and local weights and measures laws and regulations in terms of metrication and that you provide us with a concise opinion on this subject. Specifically, your analysis should distill any provision or class of provisions which could be obstacles or barriers to metrication. It would be helpful if your opinion would suggest what changes or amendments are needed, particularly as your laws and regulations relate to the models and handbooks of the National Conference on Weights and Measures. Finally we would like for you to indicate how these changes should be made considering probable difficulties which may arise and what role the National Bureau of Standards should play in coordinating this effort.

We cannot overly stress the importance of this information for the Conference. It is vitally important that weights and measures officials provide the leadership which our responsibilities demand. A summary report must be given at *this year's* Conference so I am asking that all responses be submitted to me before June 28, 1974.

We are most appreciative of your cooperation and thank you in advance. If you have any questions, please phone me at 301: 921-2401.

cc: Committee on Metric Planning

Responses to the metric inquiry identified a significant number of barriers and needs for amendments. Several statements were made which indicated the major barrier was the fact that the Congress of the United States did not pass metric legislation. It seems to us that this pinpoints the most salient metric question this year's Conference should answer.

The Fair Packaging and Labeling Act was cited as an example of the kind of barrier existing at the federal level; in particular, in Section 4(a) which implies the use of U.S. customary units. Action by the Conference through revising the Model State Packaging and Labeling Regulation could go a long way toward facilitating metrication for many items.

In view of these discussions, the committee would like to make the following recommendations to the National Conference on Weights and Measures:

1. In spite of the lack of federal legislation, the National Conference on Weights and Measures should take an active role in preparations leading to metrication.

In other words, the Conference should strive to move forward at every opportunity in all possible activities, rather than merely help coordinate in those areas where movement is already taking place.

2. There should be prepared comparable metric editions of the handbooks and comparable metric versions of the model laws and regulations.

This would require, for example, that metric codes be developed for H–44. This recommendation is based on the need for both editions during a transition phase and that, eventually, the metric versions would supersede the customary.

3. The National Conference on Weights and Measures requests that the Office of Weights and Measures continue to exchange weights and measures information relating to metric.

4. The National Conference on Weights and Measures also requests that the Office of Weights and Measures actively collect and document suggestions on changes to weights and measures methods, administration, specifications, units, and other technical requirements thought to be necessary for metrication. These items should then be reviewed by the Metric Planning Committee. Based on these reviews, authoritative voluntary guidelines should be promulgated by the Metric Planning Committee.

COOPERATION WITH AMERICAN NATIONAL METRIC COUNCIL

Several meetings were held after the interim meetings; and of particular note are the discussions which took place with Dr. Malcolm O'Hagan, executive director, American National Metric Council (ANMC), and his staff. The American National Metric Council is organized into various sector committees, one of which is titled "Commercial and Consumer Measurement Practices." This sector committee is part of a Coordinating Committee on Consumer Products. The area of coverage of this sector committee is virtually identical with those of the NCWM Committee on Metric Planning. It was agreed that duplication of effort should be avoided. For this reason, the Metric Planning Committee should be the ANMC's sector committee on Commercial and Consumer Measurement Practices, if ANMC so desires.

J. H. Lewis, *Chairman*, Washington
G. L. Johnson, Kentucky
G. E. Mattimoe, Hawaii
L. D. Holloway, Idaho
A. Sanders, Scale Manufacturers Association
W. N. Seward, American Petroleum Institute
J. Speer, Milk Industry Foundation
E. H. Stadolnik, Massachusetts
J. F. Lyles, Virginia
T. N. Troy, *Staff Assistant*, NBS

C. S. Brickenkamp, *Staff Assistant*, NBS
H. F. Wollin, *Exec. Secy.*, NCWM

Committee on Metric Planning

REPORT OF THE COMMITTEE ON EDUCATION, ADMINISTRATION, AND CONSUMER AFFAIRS

Presented by D. I. Offner, *Chairman*, Commissioner of Weights and Measures, Department of Public Safety, City of St. Louis, Missouri

(Thursday, July 11, 1974)

The Committee on Education, Administration, and Consumer Affairs submits its final report to the 59th National Conference on Weights and Measures. The report consists of the tentative report as offered in the Conference Announcement, and as amended by the final report. The report represents recommendations of the committee that have been formed on the basis of written and oral comments received during the year and oral presentations made during the open meeting of the committee.

NATIONAL WEIGHTS AND MEASURES WEEK

The committee expresses its thanks to Mr. Arthur Sanders of the Scale Manufacturers Association for his unselfish efforts through the years in promoting the Week and especially for the excellent kit of material he supplied this year to weights and measures jurisdictions and to industries. In view of Mr. Sanders' recent retirement as SMA executive secretary, the committee recommends that the National Conference on Weights and Measures formally acknowledge the dedicated efforts made by him on behalf of the weights and measures profession.

The national chairman for Weights and Measures Week, Mr. Sam Valtri, suggested, and the committee concurs, that in addition to the normal activities carried on in promoting the Week each year, one specific item or theme be promoted nationally for the Week and requests that weights and measures officials forward suggestions of themes for subsequent years.

The committee feels that the State and Local Activity Summary Report distributed during the Conference is the logical vehicle for the dissemination of information regarding local promotional activities of the Week. Since publication of the tentative report several jurisdictions did, in fact, incorporate a report of Weights and Measures Week activities in their activity summary report. The committee appreciates this response; however, it feels that many other jurisdictions could follow this example in future years. The suggested theme for next year's Weights and Measures Week promotion is "Think Metric."

SUBCOMMITTEE ON PUBLIC AFFAIRS

The committee feels that in view of the energy crisis, probable metric conversion, and financial implications involved in this proposal, this item should be deleted from our agenda at this time.

WEIGHTS AND MEASURES PROMOTIONAL ACTIVITIES

1. Weights and Measures Commemorative Stamp

The committee reluctantly advises that the Stamp Advisory Committee did not take action on our request this year. However, weights and measures officials are urged to express their support to appropriate agencies and officials for such commemorative stamps next year.

The committee is informed that the issuance of a commemorative weights and measures stamp in 1975 will depend largely on the efforts of weights and measures officials in informing their congressmen, senators, and other elected officials of the desirability of such a stamp.

2. Weights and Measures Commemorative Medallion

The committee is happy to report success in this project. The Franklin Mint has submitted samples of a weights and measures medallion commemorating the 175th anniversary of the signing by President John Adams of the first weights and measures law.

The medallion is available for sale in sterling silver and bronze. It is of proof quality. The price of the medallion is as follows:

Sterling Silver:	$15.00
Bronze:	$ 7.50
An optional presentation case for either medallion:	$ 2.50

An order form is attached to this report. Additional order forms and an explanatory brochure will be available from the NBS Office of Weights and Measures.

The committee stresses the fact that the prices quoted above are dependent on a minimum order of 500 medallions. It is important, therefore, that orders be sent as soon as possible to:

R. N. Smith
Office of Weights and Measures
National Bureau of Standards
Washington, D.C. 20234

Checks or money orders should be made payable to the National Conference on Weights and Measures.

For years the committee has been looking for the means of underwriting certain educational projects. The sale of these medallions will allow the funding of such efforts in the future.

3. Scouts of America Weights and Measures Merit Badge

Our request, including objectives and requirements, for the merit badge is presently in the hands of the Scout Selection Committee. It is expected that work will be completed in October of this year. We strongly urge all weights and measures officials to support this project by agreeing to serve as counselors for scouts wishing to qualify for the badge.

SMITHSONIAN INSTITUTION EXHIBIT OF WEIGHING AND MEASURING INSTRUMENTS

The committee was advised during the interim meeting that Dr. Jon Eklund is presently on a year's leave of absence to accept a teacher assignment in New York State. Thus, we have no choice but to keep this item temporarily in abeyance. This item will be revived and pursued when Dr. Eklund returns.

NATIONAL GEOGRAPHIC ARTICLE ON WEIGHTS AND MEASURES

Contact has been made with Mr. Kenneth Weaver, Science Editor, regarding the possibility of an article in 1976 (our bicentennial year) on weights and measures and the impact of metrication in this country. Mr. Weaver has expressed an interest in this project and, consequently, has been invited to attend and observe our next National Conference in action.

NATIONAL SURVEY OF WEIGHTS AND MEASURES ADMINISTRATION

A summary of the census of weights and measures personnel has been completed and was distributed to the Conference weights and measures delegates during registration. In addition, copies of a completed weights and measures directory, which was an outgrowth of the census information, were also distributed to the weights and measures delegates.

A second questionnaire, phase two of the national survey, covering activities and resources was sent to all jurisdictions in May of this year. The committee hopes that all weights and measures officials will respond by the suggested August 1 deadline. The committee wishes to express special thanks to Mr. Daniel Minnick of the NBS Technical Analysis Division for his dedicated efforts in the preparation and conduct of this survey.

RECOGNITION OF INDIVIDUALS FOR NOTABLE CONTRIBUTIONS

It is a recommendation of the committee that the National Conference on Weights and Measures make a genuine effort to recognize individuals, by name, for achievements suggestions, or notable contributions to the advancement of weights and measures, if only by naming names in the Conference Report. In this regard, it is the thought of the committee that while there is limited opportunity to recognize such contributions by individuals, with advancement to positions of responsibility within the Conference, this fact shoud not preclude permanent recording and acknowledgment of individual effort in the Conference Report.

This committee recognizes that a great many invaluable contributions to the advancement of weights and measures are made by dedicated officials who, for a variety of reasons, may never be either officers of the Conference or members of the standing committees.

UPDATING OF MODEL REPORT FORMS

The committee recommends that the Office of Weights and Measures update its recommended model report forms which have not been revised in recent years. In this regard the committee recognizes an increasing imperative for uniform recording and reporting methods among the several jurisdictions as meaningful statistics in weights and measures are to be assembled. The need for such information becomes all too apparent as OWM brings

statistical and other managerial expertise into its efforts to meet the administrative problems of the various jurisdictions.

DEVICE OWNER AND CONSUMER INFORMATION

It is the view of this committee that if general public understanding of today's complicated consumer problems is to be achieved in an era of shortages of materials, complicated by a gradual change to a basically unknown system of measurement, it will be essential to involve many groups (such as the scale industry, the meter industry, the packaging industry, the milk industry, and consumer spokesmen). To this end, as an initial step, the various industries are invited to assist the committee in the preparation of a list of "dos and don'ts" for their respective devices or areas of operations to be posted in business establishments for both the guidance of device owners and the understanding of the consumers.

REPORT OF SURVEY OF WEIGHTS AND MEASURES JURISDICTIONS ON PROBLEMS AND PRIORITIES

The committee polled the various weights and measures jurisdictions to secure an expression of the views on the most pressing problems now facing officials. Eighty-three jurisdictions were contacted, representing 50 States and 33 local jurisdictions. Fifteen replies were received; seven were from States and eight were from local jurisdictions. The States that responded are Alabama, California, Colorado, Michigan, Missouri, New Jersey, and South Dakota. The local jurisdictions that responded are Birmingham, Alabama; Cincinnati, Ohio; Kansas City, Kansas; Monroe County, New York; St. Louis, Missouri; St. Louis County, Missouri; Santa Clara County, California; and Ventura County, California.

Since one of the responses dealt in great detail with H–44 matters exclusively, it was felt that the S & T Committee should address itself to the points raised. Therefore, the summary below takes no account of that one reply to the survey.

A total of 33 different problems were mentioned. Since many of the problems were mentioned more than once, the tabulation shows a total of 50 specific responses. The following summary groups the responses into broad categories and indicates the number of responses for each category.

1. Quantity Control in Packages (15)

These comments related to various facets of package checking for full delivery of the labeled quantity. The comments expressed:

a. Generalized concern over the status of H–67.
b. A significant anxiety over the question of weights and measures jurisdiction over products (such as meat and flour) which are, to some degree at least, within the purview of various Federal regulatory agencies.
c. A serious concern over the delivery of full quantity of single-use blow-molded plastic containers of milk, the point being made that frequently the containers would not hold the labeled quantity.
d. Other points made in this area included the net weight of packaged turkeys (bringing up the problem of "wet tare" vs. "dry tare"); the desirability of using drained weight, instead of net weight, on canned foods; the need to establish standards for judging slack fill; and temperature considerations in milk measurement.

2. Problems Requiring Assistance from OWM in Developing Techniques and Procedures (15)

The most commonly mentioned item in this category is the need for an accurate method for testing grain moisture meters. Another point raised in this category is the need for improved odometer and taximeter testing equipment and procedures. The committee expresses the hope that an early solution to these problems is feasible.

A matter mentioned frequently was the need for additional guidelines to control technology being developed by the weighing industry. Also stressed was the need for National Conference guidance in properly displaying the unit price of gasoline. Other problems in this broad category include:

a. The need for guidance in the testing of truck scales of ever-increasing capacity with a limited amount of testing equipment.
b. The need to develop an adequate test tape for linear measuring devices.
c. The development of test procedures and equipment for use with vapor recovery systems.
d. The need for testing methods for various timing devices not now covered; for example, meters used in rental aircraft, heavy construction equipment, etc.

3. Metrication (3)

The emphasis here was on the need for a coordinated metric training plan.

4. Fiscal Constraints Under Which the Jurisdictions Operate (3)

It was pointed out that some jurisdictions' very limited budgets are making the purchase of needed new testing equipment impossible, especially in view of the probable need to acquire metric test equipment in the near future.

5. Misuse or Poor Design of Equipment (7)

In this category were mentioned:

a. The use of the same liquid meter for products of different viscosities.
b. The use of the Richardson automatic hopper scale in elevators.
c. The use of stenciled tare weights on railroad cars in determining the net weight of the load.
d. The use of truck scales as livestock scales by the addition of a 5-lb TRB.
e. Modifying an approved prototype without going back for a new approval, the point being made that the official needs guidelines to judge how far such modifications can go.
f. Nonstandardized closure methods on adjustable weights, with a suggestion that H–105–1 needs revision on this point.
g. The uses of pressure-sensitive labels (instead of permanent labels) to indicate scale or section capacity.

6. Miscellaneous Problems (7)

There was a group of problems, each mentioned once, which were difficult to fit into any broad category.

a. The old problem of "hanging weight beef."
b. Short-width roll carpeting.
c. Improper advertising.
d. Mandatory use of the term "sealer."
e. Need for better public relations programs.
f. Lack of uniformity among jurisdictions.
g. Need for additional H–44 definitions related to railroad weighing.

ORDER FORM
FOR
WEIGHTS AND MEASURES MEDALLION

Please enter my order for:

_____ Sterling Silver Weights and Measures Medallion $15.00 each

_____ Bronze Weights and Measures Medallion $ 7.50 each

_____ Presentation Case for Weights and Measures Medallion $ 2.50 each

Total amount enclosed $_____

Name _____

Address _____

_____

Make check or money order payable to:

National Conference on Weights and Measures

and mail to:

R. N. Smith
Office of Weights and Measures
National Bureau of Standards
Washington, D.C. 20234

Please allow 8 to 10 weeks for delivery after the main order is placed with Franklin Mint.

D. I. OFFNER, *Chairman*, St. Louis, Missouri
W. B. HARPER, Birmingham, Alabama
E. PRIDEAUX, Colorado
S. VALTRI, Philadelphia, Pennsylvania
R. T. WILLIAMS, Texas
R. N. SMITH, *Staff Assistant*, NBS
H. F. WOLLIN, *Exec. Secy.*, NCWM

Committee on Education, Administration, and Consumer Affairs

(Mr. Offner moved for adoption and, after a second from the floor, the report of the Committee on Education, Administration, and Consumer Affairs was adopted in its entirety by the Conference by voice vote.)

REPORT OF THE COMMITTEE ON LAWS AND REGULATIONS

Presented by R. M. LEACH, *Chairman*, Chief, Food Inspection Division, Department of Agriculture, State of Michigan

(Thursday, July 11, 1974)

The Committee on Laws and Regulations submits its final report to the 59th National Conference on Weights and Measures. The report consists of the tentative report as offered in the Conference Announcement and as amended by the final report.

The report represents recommendations of the committee that have been formed on the basis of written and oral comments received during the year and oral presentations made during the open meeting of the committee.

MODEL STATE WEIGHTS AND MEASURES LAW

1. Drained Weight

Several weights and measures officials expressed concern for the Food and Drug Administration's request for data and information on "Label Declaration of Drained Weight" published in the December 5, 1973 issue of the *Federal Register*. Even though certain commodities are already sold by drained weight, the Model State Weights and Measures Law does not reflect this practice. Section 1.2. should, therefore, be revised as follows:

1.2. Weight.—The term "weight" as used in connection with any commodity means net weight; except where the label declares that the product is sold by drained weight, the term means net drained weight.

The committee further recommends that items to be sold by net drained weight be determined on a commodity-by-commodity basis, approved by the National Conference on Weights and Measures, then listed in the Model State Method of Sale of Commodities Regulation.

1. Metrication

The National Conference on Weights and Measures has taken an advocacy position in favor of metrication, a legal system of units in the U.S. since 1866. This position should be implemented by beginning now to convert and update, where appropriate, model laws and regulations to reflect relevant information which will be needed during the transition period. A step in this direction can be made by separating customary unit abbreviations from metric symbols and following the International System of Units. The committee, therefore, recommends consideration and adoption of the following amendment:

6.4.1. Abbreviations.—Any of the following abbreviations for customary units, and none other, may be employed in the quantity statement on a package of commodity:

avoirdupois	avdp	ounce	oz
cubic	cu	pint	pt
feet or foot	ft	pound	lb
fluid	fl	quart	qt
gallon	gal	square	sq
inch	in	weight	wt
liquid	liq	yard	yd

(There normally are no periods following, nor plural forms of, these abbreviations. For example, "oz" is the abbreviation for both "ounce" and "ounces.")

6.4.2. Symbols.—Any of the following metric symbols may be employed in the quantity statement on a package of commodity:

metre	m	litre	l
millimetre	mm	gram	g
square metre	m^2	kilogram	kg

(a) The litre is widely used for volume in preference to its equivalent the cubic decimetre [dm^3].
(b) Symbols are not capitalized unless the unit is derived from a proper name. Periods should not be used after the symbol. Symbols are always written in the singular form—do not add "s" to express the plural when the symbol is used.
(c) Multiples and submultiples of the above units and symbols may be used provided they follow the guidelines of the International System (SI) of Units or ISO Standard 1000.

2. Fractions

It has been called to the attention of the committee that certain commodities are being sold to consumers in "unacceptable" fractional units of dry measure in violation of section 6.7. Specifically, the committee has been asked for an interpretation as to whether the packaging of oranges in a 4/5 bushel, which is later sold unweighed to a consumer, is a violation of the binary submultiple principle as implied in 6.7.

Some committee members asserted that a clear exception exists under section 6.7.(a) which is applicable to this long established tradition of crating citrus fruit in 4/5 of a bushel. Approximately 85 percent of this fruit is sold by this trade practice. Additionally, it was asserted that the packager never intends the 4/5 bushel to be a consumer package but if the 4/5 bushel of citrus fruit is sold to consumers this would be a matter between the appropriate State or local official and the retailer.

The consensus of the committee is that this action of the packagers is not in violation of the indicated section.

3. Motor Oils

A communication from the Society of Automotive Engineers, Inc., suggested that a word substitution be made in section 11.25. Motor Oils. The use of the word "grade" carries a connotation of quality, which is not intended, and should be changed to "viscosity number." The revised section will read as follows:

11.25. Motor Oils.—Motor oils, when packed in 1-liquid-quart units, shall be exempt from the dual quantity declaration requirements of subsection 6.6.4. Additionally, motor oil in 1-liquid-quart, 1-gallon, 1¼-gallon, 2-gallon, and 2½-gallon units, bearing the principal display panel on the body of the container, is exempt from the requirements of section 3. IDENTITY to the extent that the SAE viscosity number is required to appear on the principal display panel, provided the SAE viscosity number appears on the can lid and is expressed in letters and numerals in type size of at least one-fourth inch.

4. Packaged Seed

The Association of American Seed Control officials, in their resolution of September 27, 1973, indicated that they would strive to achieve as soon as possible a quantity statement on the label as to the number of seeds being represented. They asked that the Conference consider the use of the number of seeds in small packets and containers in lieu of the net weight declaration.

They want this change to provide more meaningful information and so that consumers will be better able to make value comparisons. This section was recently changed in keeping with the principal that, in general, solid items should be sold by weight and because of the trend toward greater use of metric units.

Arguments raised by the American Seed Trade Association (ASTA) express concern for the cost incurred because of the recent change to metric units and for the problems associated with counting extremely small seeds.

The consensus reached by the committee is that this problem should be fully aired by an ad hoc committee composed of members of ASCO, ASTA, NBS, USDA, and appropriate consumer representatives before attempting another solution. Such a meeting will be held at the National Bureau of Standards this fall. It will be chaired by Mr. R. L. Thompson.

5. Reciprocal In-plant Statistical Package Control Program

A feasibility study of having a national uniform statistical package control program has been recommended by the Western Weights and Measures Association and endorsed by the Southern Weights and Measures Association for consideration by the committtee. The ultimate goal of this program would be to allow an exchange and acceptance of in-plant control information between jurisdictions. All information received concerning this suggestion has been, and will be, sent directly to the NBS Office of Weights and Measures for their consideration in the development of a new NBS Handbook 67.

6. Net Weight Labeling

A number of State and local weights and measures officials expressed concern about the APHIS proposal published in the December 3, 1973 issue of the *Federal Register*. This proposal sought to amend part of the federal meat inspection regulations (9 CRF, part 138).

Because of time constraints, submissions were due by April 5, 1974, and because there was a clear consensus in opposition to this proposed rule, it was decided that it would be expeditious and proper for the committee to take action which could be ratified by the Conference at its annual meeting. The action taken was a formal transmittal to the Hearing Clerk, USDA, stating the basis for opposition to this proposed rule.

1. Meat, Poultry, and Seafood Products

It was brought to the attention of the committee that a great deal of confusion (and lack of uniformity) exists as to what is permissible with respect to the method of sale of precooked, stuffed turkeys. Among other methods, this item is sold by:

a. weight range before cooking
b. quantity sufficient to serve a specified number of people
c. size (small, medium or large)
d. average weight after cooking

Clarification is sought as to which method is preferred by the Conference. The preferred method will be included in the Model State Method of Sale of Commodities Regulation to encourage uniformity. The committee felt that the consumer is most concerned about the weight of the meat before cooking. Weights and measures enforcement, at the point of sale, would be difficult on any basis other than total weight of the product after cooking.

The committee will issue a guideline as to the preferred method of sale for these items in next year's tentative report. Comments are requested.

2. Sale of Eggs by Weight

Communications have been received concerning the addition of a section to the Model Regulation for the sale of eggs by weight. The American Egg Board is promoting research studies and, through Kansas and other States, it has been suggested that this issue should be brought to the attention of the Conference. Additionally, the packaging and labeling program of OWM has received information that there may be concern when a consumer gets 11 eggs of equal size and one which is obviously "too small" because the consumer believes he is buying eggs by count (one dozen) when, in fact, the controlling factor is weight. This means that the "too small" egg is perfectly legal in some jurisdictions, and is used to reduce "overpack" by the seller.

The committee believes that the present method of sale is fully informative and that there is adequate regulation with current State egg laws coupled with the USDA grading system. The committee further believes that it would be premature for the Conference to consider any action until the final reports of studies on the sale of eggs by weight have been completed.

3. Fluid Milk Products

The International Paper Company has proposed that a three-quart milk package be adopted as a standard package size by the National Conference on Weights and Measures. This would require a revision to section 6, to provide for the inclusion of this new size.

The proposal indicates that it is permissible to sell milk in three-quart containers in a few States at the present time and Conference approval is sought to achieve nationwide acceptance and uniformity. It was also pointed out that the three-quart container would yield significant savings in scarce materials such as paperboard and plastic coatings.

Although the United States has not established a national policy committing itself to conversion to the metric system, the committee has taken an advocacy position on going metric and consideration will ultimately have to be made to adding liter sizes. Additionally, adding another size in customary units could be construed as undue proliferation, which is a sensitive issue with consumer groups.

The consensus of the committee is that they should not oppose this request at this time but that it be brought to the floor for a vote without a committee endorsement. The committee needs to receive additional inputs from other segments of industry, weights and measures officials, and other concerned interests.

4. Other Milk Products

Concern was expressed over the possibility of undue proliferation of package sizes for cottage cheese. It is felt that this can be avoided by limiting the allowable package sizes for cottage cheese as provided in section 7. for sour cream and yogurt.

It is the consensus of the committee that evidence of actual proliferation of sizes is needed before considering what further action should be taken. The Milk Industry Foundation has agreed to survey the current situation and submit a report to the committee by the next interim meeting.

5. Cardboard Carton Containers

Copies of letters received by the New York Bureau of Weights and Measures regarding cardboard containers were forwarded to the committee. These letters highlight the confusion that exists when these containers are sold to new businesssmen by an identity number, which is often mistaken for the size of the box. For

example, a 30 x 4 identification number refers to a box whose actual size is 27½ x 3¼ inches. It is suggested that a new section be added to the Method of Sale of Commodities Regulation so that these containers can be sold on a basis which will provide more accurate information.

An important argument in support of adding a new section is that small businesssmen just getting started need as much assistance as can be provided in order to survive and grow.

An argument opposing this change is that a table, similar to Table 1 of section 10, Softwood Lumber, could be printed showing the relationship between identity and size but this would not solve the problem.

It is the consensus of the committee that these containers should be sold by actual size. The committee does not believe, however, that every trade practice must be controlled through the model laws and regulations. This is particularly true where the item does not directly concern the consumer. The committee, therefore, recommends that the appropriate trade associations be contacted and asked to correct this practice on a voluntary basis.

6. Combination Quantity Declarations

Previous National Conferences have recognized that numerous packaged products bearing combination quantity declarations presented problems in applying the average concept to such quantity declarations. It was decided to deal with this problem on a case-by-case basis; and last year the first of these regulations, for paper plates, was specified.

This year the committee continued discussions with the American Glassware Association (AGA) to define allowable differences for the following items:

Beverageware: Pressed and Blown Tumblers and Stemware

Up to 5 oz capacity	± ¼ oz tolerance
Over 5 oz capacity	± 5% tolerance

Pressed Items: Small (Bowls, blenders, pitchers, sherbets, desserts, soups, cups, mugs)

Up to 6 oz capacity	± ⅜ oz tolerance
Over 6 oz capacity	± 6.25% tolerance

Pressed Items: Large (Bowls, mixing or casserole; loaf pans; utility dishes; roasters)

Up to 2 qt capacity	± 4 oz tolerance
Over 2 qt capacity	± 6.25% tolerance

Blown Items, T.T. (Pitchers, apothecaries)

Up to 2 qt capacity	± 4 oz tolerance
Over 2 qt capacity	± 6.25% tolerance

The committee finds the proposed tolerances for beverageware to be acceptable and recommends consideration and adoption of the following and appropriate renumbering of existing sections:

16.1. Beverageware: Pressed and Blown Tumblers and Stemware.—The allowable difference between actual and declared capacity shall be:

(a) Plus or minus ¼ oz for items of 5 oz capacity or less;
(b) Plus or minus 5 percent of the stated capacity for items over 5 oz capacity.

The tolerances proposed for the other items exceed the standard of the American National Standards Institute (ANSI), which is 5 percent. For this reason, and because AGA members do not have a sufficient percentage of the market for the other three categories, the committee feels that additional data is required from other manufacturers before action on those categories can be considered.

The committee concurs with the proposal received from the American Paper Institute and, therefore, recommends consideration and adoption of the following amendment:

16.3. Sanitary Paper Products.—The allowable difference between actual and declared dimensions for toilet tissue shall be plus or minus 1/16 inch. The allowable difference for paper towels, paper napkins, and facial tissue shall be plus or minus ⅛ inch.

The committee also considered, with appropriate trade associations and other interested persons, other items which include paper cups, paper containers, plastic containers, and thermos bottles. The committee would like to receive information and data as to suggested allowable differences for the above or for any other items for which an allowable difference should be established.

7. Railroad Car Tare Weight

The National Scale Men's Association recommended to the committee that reweighing and restenciling of freight cars, under certain conditions, be done only by the car owners or their repre-

sentatives. They want the exceptions outlined in section 2 C of Rule 70 of the Field Manual of the Association of American Railroads Interchange Rule of 1973, to be incorporated in the Model State Method of Sale of Commodities Regulation, section 17.

The Association indicated that the reason they want this change is because the rule, as now constituted, leaves considerable room for tare weight error.

No identifiable arguments were raised opposing the change at last year's National Conference, but since this item was not placed on the agenda until the interim meeting, it is not clear if the committee efforts to provide a speedy response to this problem might later prove to be unfair. The consensus of the committee is if no significant opposition arises before the annual meeting of the National Conference, the AAR section should be incorporated in the Regulation this year. The committee, therefore, recommends consideration and adoption of the following amendment and appropriate renumbering of existing sections:

17.5 Tank cars, covered hopper cars, flat cars equipped with multideck racks, or special superstructure, mechanical refrigerator cars, and house-type cars equipped with special lading protective devices must be reweighed and restenciled only by owners or their authorized representatives.

(a) When car bears no lightweight (empty weight) stenciling.
(b) When repairs or alterations result in a change of weight in excess of the permissible lightweight tolerance.

MODEL STATE UNIT PRICING REGULATION

1. Presentation of Unit Price

The committee now believes that this issue should not be decided this year. The problem is more than the committee initially perceived it to be. Therefore, the committe recommends that this item be tabled until next year.

OTHER ITEMS

1. Precooked and Prepared Foods

From the State of Hawaii comes the suggestion that the National Conference should consider the development of a Model State Menu Regulation.

Directly involved would be the enforcement of listed quantity statements of such items as 10-ounce steaks and of identity statements such as baby beef liver and Roquefort dressing.

The only comment received was a transmittal from the National Restaurant Association (NRA). No comments were received from weights and measures officials or from other consumer advocates. Because of the persuasive arguments contained in the NRA transmittal and because of the apparent lack of favorable interest, the committee recommends that this item be tabled indefinitely.

2. Importation of Packages in Violation of Legal Requirements

The Southern Weights and Measures Association requested that the appropriate committee within the framework of the National Conference determine what action the Federal Government can successfully take to preclude the importation of packages not in compliance with existing Federal and State laws and regulations.

The committee concluded that no direct action can be taken within the scope of the model laws and regulations. It is the recommendations of the committee that this issue be forwarded to the Committee on Liaison with the Federal Government, because of its mission to coordinate with other federal agencies, for its consideration. The Liaison Committee has indicated that more factual information would be useful. Thus, anyone wishing to comment on this issue should write directly to the Committee on Liaison with the Federal Government.

The Committee on Laws and Regulations extends its thanks to all those members of the Conference and business and industry representatives who submitted items for consideration. Only through such continuing communications can the committee fulfill its function to the Conference.

R. M. Leach, *Chairman*, Michigan
S. D. Andrews, Florida
J. L. O'Neill, Kansas
R. L. Thompson, Maryland
C. H. Vincent, Dallas, Texas
T. N. Troy, *Staff Assistant*, NBS
H. F. Wollin, *Exec. Secy.*, NCWM

Committee on Laws and Regulations

(Mr. Leach moved for adoption and, after a second from the floor, the report of the Committee on Laws and Regulations was adopted in its entirety by the Conference by voice vote.)

REPORT OF THE COMMITTEE ON SPECIFICATIONS AND TOLERANCES

Presented by TRAFFORD F. BRINK, *Chairman*, Director, Division of Weights and Measures, Department of Agriculture, State of Vermont

(Thursday, July 11, 1974)

The Committee on Specifications and Tolerances submits its report to the 59th National Conference on Weights and Measures. The report consists of the tentative report as offered in the Conference Announcement and as amended by its final report.

The report represents recommendations of the committee that have been formed on the basis of written and oral comments received during the year and oral presentations made during the open meeting of the committee. All recommended amendments are to appropriate provisions of the codes of the National Bureau of Standards Handbook 44, Fourth Edition, *Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices.*

GENERAL CODE

1. *G.S.1. Identification.*—A recommendation was received from the Southern Weights and Measures Association that the part of this paragraph requiring a nonrepetitive serial number be made retroactive for remanufactured or rebuilt commercial devices. It is the committee's interpretation of paragraph G–A.6. Nonretroactive Requirements that equipment that has been removed from service and substantially rebuilt has again been "manufactured" and that it would be the rebuilder's responsibility to mark that equipment with all of the information required under paragraph G.S.1. including a nonrepetitive serial number.

To provide a clearer understanding of Paragraph G–A.6., the committee recommends the addition of the following definition to the General Code:

Manufactured Device: Any new device and any other device that has been removed from service and substantially altered or rebuilt.

(The foregoing item was adopted by voice vote.)

2. *G-UR.1.1. Suitability of Equipment.*—Following the publication of the S & T Committee's tentative report of 1973, the committee received a communication from the state of Colorado concerning the problems brought about by increased prices and the limited unit prices of many computing scales in use. Since the committee did not have adequate time to fully study the problem in its 1973 final report, it referred the item for study during the ensuing year. Since that time, a recommendation has been received from the Northwest Weights and Measures Association that a reference to unit prices be included in this paragraph.

It was the committee's view that this problem extended beyond selling prices exceeeding the unit prices of computing scales; specifically, that retail merchants were establishing selling prices of commodities at prices different from the unit prices included on computing scales. For example, a selling price for a particular commodity could be advertised as 4 pounds for $0.49; and since this unit price did not appear on computing scales, the clerk or cashier would establish the total price based on a unit price of $0.13 a pound.

So that these conditions can be corrected, the committee recommends this paragraph be amended to read:

G–UR.1.1. Suitability of Equipment.—Commercial equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to its weighing capacity (for weighing devices), its computing capability (for computing devices), its rate of flow (for liquid-measuring devices), the character, number, size, and location of its indicating or recording elements, and the value of its smallest unit and unit prices.

It is the committee's view that the application of this paragraph in the enforcement process is an administrative responsibility. It is not intended to preclude the use of computing scales with unit prices which differ from the selling prices of commodities. However, when problems are found to exist, the weights and measures administrator should communicate these problems to the users of this equipment and jointly work toward a satisfactory solution to pricing errors.

(The foregoing item was adopted by voice vote.)

3. *G-UR.2.2. Installation of Indicating or Recording Element.*—A recommendation was received from the Southern Association that this requirement be amended to require an indicating element to be installed so that an individual located at the weighing or measuring element could observe the quantity indication. It

was the committee's view that this is appropriate only in direct sale applications; that is, when both buyer and seller are present when the quantity is being determined, and recommends the following:

Amend G–UR3.2. to read:

G–UR.3.2. Position of Equipment.—A device equipped with a primary indicating element and used in direct sales, except a prescription scale, shall be so positioned that its indications may be accurately read and the weighing or measuring operation may be observed from some reasonable "customer" position. The permissible distance between the equipment and a reasonable customer position shall be determined in each case upon the basis of the individual circumstances, particularly the size and character of the indicating elements.

(The foregoing item was adopted by voice vote.)

4. *Design of Digital Indicators.*—Several suggestions were received from Toledo Scale Company and the Northwest Association for new requirements for digital devices. It was the committee's view that last year's recommendations as adopted by the Conference were suitable and that further requirements were not necessary at this time. However, there was a need for a definition of the word "increment." Therefore, the committee recommends adding the following definition to the General Code:

Increment: The value of the smallest unit that can be indicated or recorded by a digital device in normal operation.

(The foregoing item was adopted by voice vote.)

SCALE CODE

1. *Digital Indicators.*—The committee received from Toledo Scale Company a detailed report concerning digital designs and recommendations for additional requirements. It was the committee's view that this was an excellent report and that when reviewed by weights and measures officials, would certainly provide them with a clearer understanding of digital systems. The committee encouraged Toledo Scale Company to make this presentation to all state and regional meetings.

After careful consideration of this study, the committee recommends the following:

Add a new requirement S.1.4. as follows:

S.1.4. Digital Indications.—The zone of uncertainty on digital indicating scales shall be not greater than 0.3 the value of the minimum operating increment.

Renumber paragraphs S.1.4., S.1.5., and S.1.6., to read S.1.5., S.1.6., and S.1.7.

It is not intended that tests to determine compliance with the design criteria set forth in S.1.4. be conducted in the field where environmental factors may influence the test. Therefore, the committee recommends adding the following note to the Scale Code:

N.1.5. Zone of Uncertainty Test.—The zone of uncertainty test on digital instruments shall be conducted under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained.

Renumber present paragraph N.1.5 to read N.1.6.

Add the following definition:

Zone of Uncertainty: The zone between adjacent increments on a digital device in which the value of either of the adjacent increments may be displayed.

(The foregoing item was adopted by voice vote.)

2. *Livestock Scales and Weighing.*—A recommendation was received from the Southern Association to delete all references to animal scales since there are many instances when single heads of livestock are weighed on a livestock scale. After consulting with USDA Packers and Stockyards Administration, it is the committee's view that the present references to animal scales are appropriate. However, it is not the intent of existing Handbook 44 requirements to prohibit the occasional weighing of a single animal on a livestock scale. It is intended that when only single animals are weighed at a buying station that they be weighed on a single animal scale. The committee recommends the definition of animal scale be amended by deleting the terms "adapted to" and inserting the words "designated for" so as to read:

Animal Scale: A livestock scale designed for weighing single heads of livestock.

It was also brought to the attention of the committee that large capacity motor vehicle scales were being equipped with stock

racks and used for weighing trucks or livestock on the hoof. It is the committee's view that a five pound minimum graduation on a 50 ton scale is not appropriate. However, it would be appropriate to weigh large amounts of livestock on the hoof on a 50 ton scale. To make provision for this type of weighing, the committee recommends that the definition of "livestock scale" be amended to read:

Livestock Scale: A scale of 60,000 pounds capacity or less equipped with stock racks and gates and adapted to weighing livestock standing on the scale platform.

This amendment means that a scale of more than 30 tons capacity equipped with stock racks will be considered a motor vehicle scale when applying the requirement of Handbook 44. It is the committee's view that when a motor vehicle scale is used for weighing livestock on the hoof that it would be unsuitable to weigh loads of livestock of 10,000 pounds or less with a 20 pound minimum graduation or loads of less than 5,000 pounds with a 10 pound minimum graduation. Therefore, the committee recommends that UR.3.2. be amended by adding the following requirement:

UR.3.2.1. Used for Weighing Livestock.—A vehicle scale with a capacity of more than 60,000 pounds that is adapted to weighing livestock shall not be used for weighing net loads of livestock of less than 10,000 pounds when the value of the smallest unit is 20 pounds; or less than 5,000 pounds when the value of the smallest unit is 10 pounds.

The USDA Packers and Stockyards Administration also expressed a concern that when an in-motion monorail scale with a one-pound minimum increment was being used, many times the tare value of the gambrels and hooks were not whole pounds. Consequently, if the tare value were to be 7.5 pounds with a one-pound minimum increment, there would be a constant error in every weighing of ½ pound. To alleviate this problem, the committee recommends adding the following new paragraph:

S.2.1.4. For Monorail Scales.—On a monorail scale equipped with a digital indicator, means shall be provided for setting the zero-load balance and any tare value of less than five percent of the scale capacity to within 0.1 the value of the minimum operating increment. On an in-motion system, means shall be provided to automatically maintain the zero-load balance condition and tare values to within 0.2 the value of the minimum operating increment.

Renumber present paragraph S.2.1.4. to S.2.1.5.

The report of the Northwest Association S & T Committee expressed the concern that many times the tests of livestock and vehicle scales had to be postponed due to the effects of wind. It was their view that if wind affected the testing, it also would affect weighing in normal operation. In recognition of this problem, the committee recommends amendment to UR.2.3. as indicated below; however, the committee also wishes to express the view to the Conference that this amendment will not make mandatory that weighing elements be covered. Rather, when a problem exists, this paragraph is the basis for requiring adequate protection.

UR.2.3. Protection Against Wind and Weather Effects.—The indicating elements, the lever system or load cells, and the load-receiving element of a permanently installed scale, and the indicating elements of a scale not intended to be permanently installed, shall be adequately protected against wind and weather effects.

(The foregoing item was adopted by voice vote.)

3. *Railroad Track Scales and Weighing Practices.*—Suggestions and recommendations for Handbook 44 amendment for railroad track scales and weighing practices were received from the Northwest, Southern, and Western Weights and Measures Associations. Included were the following: (1) Provide a separate code for railroad track scales; (2) Eliminate the commercial application of certain railroad weighing practices; and (3) Change definition of "unit train" and provide definition for "test train."

At its interim meeting the committee heard comments from a number of railroad representatives, users of railroad track scales, and weights and measures officials. After careful consideration and due deliberation concerning all of these suggestions, the committeee offers the following comments and amendments:

(1) At the present time, there is no need for a separate code for railroad track scales.

(2) As stated in the S & T Committee's final report of 1973, the requirements recommended and adopted by the Conference were the committee's attempt to resolve a difficult problem, and the applications of these requirements would determine the feasibility and practicability and will require the cooperation of all concerned. At this time it is the committee's view that these requirements have not been in force for a sufficient amount of time to determine their full effect. The railroad industry will continue to study railroad weighing practices and provide data to the S & T Committee.

(3) Since a problem seems to exist concerning the definitions of "unit train" and "test train" and the application of tolerances, for clarification purposes, the committee recommends the following amendments:

Delete present definition for "unit train."

Add a new paragraph N.2.1. to read:

N.2.1. For Coupled-In-Motion Tests.—The test train shall be a train of no less than 10 cars yielding 100 car weights.

Delete T.3.6.3. Weighing Coupled-in-Motion Unit Trains and T.3.6.4. Weighing Coupled-in-Motion Cars.

Add a new T.3.6.3. to read:

T.3.6.3. Weighing Coupled in Motion.—The basic maintenance and acceptance tolerances shall be as follows:

(a) The difference between the motion gross weight value and the static weight value of the test train shall not exceed two pounds per 1,000 pounds (0.2 percent).

(b) The difference between the motion gross weight values and the static weight values on 100 car weights shall not exceed:

(1) 0.2 percent on 30 car weights,

(2) 0.5 percent on 5 car weights, and

(3) 1.0 percent on any car weight.

(The foregoing item was adopted by voice vote.)

4. *Construction Materials Hopper Scales.*—A recommendation was received from the Scale Manufacturers Association to provide a minimum tolerance on construction material hopper scales equal to the value of the minimum graduated interval. The committee recommends the following:

Amend T.2.8. to read:

T.2.8. For Crane and Construction Material Hopper Scales.—The minimum tolerance shall be 0.1 percent of the weighing capacity of the scale or the value of the smallest unit, whichever is less.

Amend T.2.1. Minimum Tolerance Values, General by inserting the term "construction material hopper" after the word "crane."

Amend the heading in table 3 by inserting the term "construction material hopper" after the word "crane."

Add the following new definition:

Construction Material Hopper Scale: A scale adapted to weighing construction materials such as sand, gravel, cement, and hot oil.

Amend the last sentence in the definition of "hopper scale" so it will read:

See also automatic hopper scale, grain hopper scale, and construction material hopper scale.

(The foregoing item was adopted by voice vote.)

5. *Value of Minimum Graduated Intervals.*—Because digital indicating scales do not have minimum graduated intervals, but rather increments, the committee recommends that UR.1.1. Value of Minimum Graduated Intervals on Primary Indicating and Recording Elements be amended to read:

UR.1.1. Value of the Smallest Unit on Primary Indicating and Recording Elements.

Amend the remaining UR.1. Selection Requirements by deleting all references to the "value of the minimum graduated interval" and inserting the term "value of the smallest unit."

(The foregoing item was adopted by voice vote.)

CODE FOR LIQUID MEASURING DEVICES

1. *Unit Price Computing Capability.*—The committee received several comments concerning the limited unit price capability on certain retail petroleum dispensers. At its interim meeting, it heard several presentations concerning available modifications for these devices. It is the committee's view as an interim measure that the recommendation made by the Office of Weights and Measures in its memorandum of December 6, 1973; that is, to set the variator at one-half the unit price, etc., be officially recognized in all jurisdictions until modifications can be made.

It is also the committee's view that:

The appropriate modification of gasoline dispensers would be extending the variator capability to 99.9 and a four-decade ($99.99) total price indication.

"The $14.99" modifications of gasoline dispensers would have a limited life and eventually a four-decade total price indication would be necessary. Further, if this modification were to be made, it would only be appropriate for sales not exceeding that amount.

The committee's long-range solution for this problem is to encourage the American Petroleum Institute to take immediate action and initiate the use of the metric system throughout the petroleum industry. Obsolete dispensers could then be directly converted to, or replaced with, metric indicating equipment.

The committee wishes to recommend to program administrators that before the issuance of regulations setting specific dates for the modification of $.499 variators, discussions be held with petroleum dealers affected and suppliers of the modifications to make certain the specified dates are realistic.

(The foregoing item was adopted by voice vote.)

2. *Tolerance Tables.*—A communication was received stating that there was some confusion as to the meaning of the word "indication" as it appeared in the left-hand column of all of the tolerance tables. It was the committee's view that there was no need to reprint these tables but to remind the Conference that this word applies to the indication of the device under test.

(The foregoing item was adopted by voice vote.)

3. *Temperature Compensation.*—A detailed, comprehensive study was received from the state of Hawaii outlining the reasons for implementing the temperature compensation of liquid hydrocarbons at retail.

The state of Hawaii also made an audiovisual presentation to the committee at its interim meeting with a recommendation that amendments be made to Handbook 44 to permit temperature compensation at retail. It was generally the view of the committee that this action would allow gasoline to be sold at retail either temperature compensated or not temperature compensated and that this practice could bring about more confusion in the marketplace. Since it is the object of weights and measures administration to provide and maintain uniform standard units, this would in effect provide two different units: (1) 231 cubic inches per gallon at any temperature, and (2) 231 cubic inches at 60 degrees. After a lengthy discussion, the committee could not reach agreement and, therefore, had no recommendations but suggested that the state of Hawaii make a presentation at the National Conference.

At the Conference, a motion was moved and seconded that the LMD Code be appropriately amended to provide permissive temperature correction of petroleum products sold at retail.

(After lengthy discussion, the foregoing item was defeated by a standing vote)

However, Mr. Harold F. Wollin, executive secretary of the Conference, assured the Conference that the Office of Weights and Measures of the National Bureau of Standards would continue to study the issue of temperature compensation at retail.

4. *N.4.3.2. Temperature Adjustment.*—A recommendation was received from the Northwest Association that this paragraph be amended to make reference to an appropriate petroleum measurement table for determining changes in volume brought about by a change in temperature. The committee wishes to call to the attention of the Conference that in NBS Handbook 112, "Examination Procedure Outlines for Commercial Weighing and Measuring Devices," in EPO No. 25, the procedure for the examination of loading rack meters, reference is made to ASTM-IP Petroleum Measurement Tables. It is the view of the committee that when corrections are made that these tables be used. The publication entitled "ASTM–IP Petroleum Measurement Tables, D–1250" is available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. The committee recommends that N.4.3.2. be amended by striking the last sentence of the paragraph and inserting the following:

When adjustments are necessary, appropriate petroleum measurement tables should be used.

Amend N.5. Temperature Correction on Wholesale Devices with Automatic Temperature Compensation by adding to the end of the paragraph the same sentence as was added to N.4.3.2.:

When adjustments are necessary, appropriate petroleum measurement tables should be used.

(The foregoing item was adopted by voice vote.)

CODE FOR VEHICLE TANK METERS

1. *Split Compartment Test Tolerances.*—Over the last several years, the committee has received numerous comments that the tolerances applicable when conducting a split compartment test on a vehicle tank meter are impractical. The existing tolerances are based on the capacity of the prover used in the test; however, the error resulting from this test is not a function of prover capacity but rather it is related to the rate of flow and the system itself. The committee agrees with these comments and recommends changing these tolerances by amending the Vehicle Tank Meter Code as follows:

Add the following new table T.2.:

TABLE 2.—TOLERANCES FOR VEHICLE TANK METERS ON SUPPLY EXHAUSTION TESTS EXCEPT MILK METERS

Manufacturer's rated capacity (Maximum gpm)	Maintenance and acceptance tolerances
Up to 125	125 in^3
126–250	200 in^3
251–500	300 in^3
Over 500	400 in^3

Amend T.2. to include table 3 and renumber present table 2 to table 3.

To further clarify this table, the tolerances listed are applied from "0" (zero)—not added to the error found during a normal test.

Since these requirements are applicable to wholesale devices in the LMD Code, appropriate amendments are recommended to be made to that code.

(The foregoing item was adopted by voice vote.)

TENTATIVE CODE FOR CRYOGENIC LIQUID MEASURING DEVICES

1. *Cryogenic Liquid Measuring Devices.*—The committee recommends this code remain tentative for at least another year.

(The foregoing item was adopted by voice vote.)

CODE FOR VEHICLE TANKS USED AS MEASURES

1. *S.2.4. Design of Compartment Indicators, Location.*—A suggestion was received from the Northwest Association that paragraph (c) limits the marker from extending into the fill opening but provides no limit for placing the marker back from the fill opening. The committee recommends that this paragraph be amended to read:

(c) So that it shall not extend into, nor more than six inches from, that section of the compartment defined by a vertical projection of the fill opening.

(The foregoing item was adopted by voice vote.)

CODE FOR GRADUATES

1. *T.1. Table 3.*—A suggestion was received from the Northwest Association that the headings in this table be amended since measurements between the given whole values do exist and the question arises that if the inside diameter of a graduate is 20.5 millimeters, what tolerance would be applied? The committee recommends that this table's columnar subheadings be amended accordingly. The recommended new columnar subheadings and several entries from the table are as follows:

TABLE 3.—MAINTENANCE AND ACCEPTANCE TOLERANCES, IN EXCESS AND IN DEFICIENCY, FOR GRADUATES

Inside diameter of graduate		Tolerance	Inside diameter of graduate		Tolerance
From	to but not including		From	to but not including	
Inches		*Fluid drams Minims*	*Millimeters*		*Milliliters*
0	9/16	2	0	16	0.1
9/16	13/16	3	16	21	0.2
13/16	1-1/16	6	21	25	0.4

(The foregoing item was adopted by voice vote.)

2. *S.3. Shape.*—A communication was received indicating that some graduates were found to be elliptical in shape. It was the view of the committee that paragraph S.3. Shape precluded the use of elliptical graduates. However, for further clarification, the committee recommends this paragraph be amended to read:

S.3. Shape.—A graduate of a capacity of more than 4 fluid drams (15 milliliters) may be of either the conical type having a circular interior or the cylindrical type. A graduate of a capacity of 4 fluid drams (15 milliliters) or less shall be of the single-scale cylindrical type.

(The foregoing item was adopted by voice vote.)

CODE FOR ODOMETERS

1. *N.1. Mileage Tests.*—For clarification purposes, the committee recommends the following N.1. paragraphs be amended to read:

N.1. Testing Procedures.

N.1.1. Test Methods.—To determine compliance with mileage tolerances, a mileage test of an odometer shall be conducted utilizing one or more of the following test methods:

(a) Road Test.—A road test consists of driving the vehicle over a precisely measured road course.

(b) Fifth-Wheel Test.—A fifth-wheel test consists of driving the vehicle over any reasonable road course and determining the distance actually traveled through the use of a mechanism known as a "fifth wheel" that is attached to the vehicle and that independently measures and indicates the distance.

(c) Simulated-Road Test.—A simulated-road test consists of determining the distance traveled by use of a roller device. or by computation from rolling circumference and wheel-turn data.

N.1.2. Test Runs.—Test runs shall include a minimum of two runs at least two miles in length. The test runs shall start from, and finish at, a dead stop with a minimum of 80 percent of the run at a speed of approximately 45 miles per hour. The acceleration and deceleration shall be carefully controlled to avoid spinning or skidding the wheels.

N.1.3. Test Conditions.

For further clarification, a new N.1.3.2. is added as follows:

N.1.3.2. Tire Stabilization.—Road tests or fifth-wheel tests shall be preceded by a run of at least 5 miles for the purpose of stabilizing tire temperatures. Simulated road tests on a roller device shall be made at stable tire pressures.

Renumber present paragraph N.1.3.2. to read N.1.3.3.

(The foregoing item was adopted by voice vote.)

TENTATIVE CODE FOR TIMING DEVICES

1. *Timing Devices.*—Based on the suggestions received, the committee recommends that this code be removed from tentative status and made final.

(The foregoing item was adopted by voice vote.)

OTHER ITEMS

1. *Unleaded Gas Contamination.*—It was brought to the committee's attention by representatives of the American Petroleum Institute (API) that unleaded gas could be contaminated during tests of equipment used to deliver this product. In recognition of these problems, the API informed the committee that it has been

recommended that all fill openings in service stations be uniformly identified.

It was their recommendation that in the test of petroleum dispensers at service stations, unleaded product should be returned to unleaded supply since a five-gallon test measure that had been previously used to test other products, when properly drained, could not contaminate unleaded product.

They further recommended the following:

(a) Communicate with the operator of the equipment to be tested to make certain a clear understanding exists as to the problems involved and that contamination will not result in the conduct of any tests.
(b) In service station tests, request operators to sign a form prior to conducting any tests, stating the following (or words of similar import): "I certify that I have directed the return to storage of all products used during test."

(The foregoing item was adopted by voice vote.)

2. *Scale Manufacturers Association Recommendation for Scale Pits.*—The 56th Conference in 1972 endorsed a publication of SMA entitled "Recommendation for the Design and Installation of Pit-Type Scales for Weighing Highway Vehicles and their Axle Loads." In response to requests received, the SMA has developed a supplement to this publication entitled "Recommended Construction Standards for Vehicle Scale Pits." The committee has reviewed this document and recommends its endorsement by the Conference.

(The foregoing item was adopted by voice vote.)

3. *Liquid Feed Supplements and Heavy Oils.*—In a communication from the Southern Association, it was stated that the use of meters for measuring liquid feed and heavy oils is increasing rapidly. Since conventional provers cannot be used to test these devices, it was their recommendation that the Office of Weights and Measures conduct a study as soon as possible so that test equipment, methods, procedures and requirements, where necesary, are available.

(The foregoing item was adopted by voice vote.)

4. *Weights and Measures Studies.*—Comment was received from the Western Association that various jurisdictions were conducting studies in a number of measurement areas. It was

their view that the NCWM S & T Committee could best serve as a clearinghouse on device studies; and with the cooperation of all weights and measures jurisdictions and industry, duplication of effort could be prevented and assistance could be provided. A form entitled "Report of Device Study Underway" was included and copies were available at the Conference.

(The foregoing item was adopted by voice vote.)

5. *Weighing Household Goods When Moving.*—At its interim meeting the committee heard a presentation by Mr. Charles Coon of the American Movers Conference requesting consideration for increased tolerances when weighing household goods. This request was made to recognize on-board weighing systems which are not technically capable of meeting the existing tolerances for motor vehicle scales. It was the committee's recommendation that this item be brought to the attention of the Conference.

(The foregoing item was adopted by voice vote.)

The committee expresses its appreciation to all who have contributed to and participated in the committee deliberations. The committee urges all weights and measures officials and other affected parties to promptly communicate with the committee on all matters of concern. It is only in this manner that the committee can consider all problems and fully evaluate all situations prior to issuing its reports.

T. F. Brink, *Chairman*, Vermont
W. E. Czaia, Minnesota
M. L. Kinlaw, North Carolina
K. J. Simila, Oregon
W. S. Watson, California
O. K. Warnlof, *Staff Assistant*, NBS
H. F. Wollin, *Exec. Secy.*, NCWM

Committee on Specifications and Tolerances

(Mr. Brink moved for adoption; and after a second from the floor, the report of the Committee on Specifications and Tolerances was adopted in its entirety by the Conference by voice vote.)

(On motion of the committee chairman, seconded from the floor, the Conference by voice vote authorized the executive secretary to make any appropriate editorial changes in the language adopted by the Conference, provided that the requirements thus adopted are strictly adhered to.)

REPORTS OF ANNUAL COMMITTEES

REPORT OF THE EXECUTIVE COMMITTEE

Presented by J. H. LEWIS, *Chairman*,
Chief, Weights and Measures Section, Dairy and Food Division,
Washington Department of Agriculture

(Wednesday, July 10, 1974)

The Executive Committee of the National Conference on Weights and Measures met in open session on Monday, July 8, 1974, at 1:00 P.M. The following items were presented for consideration and action by this Conference:

1. *Plans for the 60th National Conference.*—The plan and general arrangements for the 60th National Conference on Weights and Measures were reviewed and include the following principal features:

Site: San Diego, California
Hotel: Sheraton Harbor Island Hotel
Dates: July 13–18, 1975
Rates: Single $22; double $27; suites are available in the price range of $50 and up.

Other arrangements are open. An unusually large attendance is anticipated.

2. *Future Conference Sites.*—Since it is necessary to make plans for future meetings of the National Conference several years in advance, the committee recommends that the executive secretary proceed with arrangements according to the following schedule and details:

1976: July 10–16—Washington, D.C .
Shoreham Americana Hotel
"Bicentennial Year" with special events
1977: State of Texas (site selection and arrangements to be made)

3. *Program Format.*—The committee is in agreement that the program for the 60th National Conference (1975) should follow

the general format that was established for this Conference meeting. It is recommended that foreign speakers be included in the Conference program to broaden the input in metrication and OIML related activities.

The committee would like to encourage members of the Conference to send in their suggestions as to program speakers. topics, schedules, and related matters to the executive secretary so that such suggestions may be considered by the incoming Executive Committee in the development of the program for next year.

4. *Committee on Metric Planning.*—A Committee on Metric Planning was established as a result of action which occurred during the interim committee meetings January 29 through February 1, 1974. The committee consists of all members of the Committee on Liaison with the Federal Government and, in addition, G. Johnson, Kentucky; J. Lewis,, Washington; and G. Mattimoe, Hawaii. The committee will serve for a period of two years.

5. *Report of the Associate Membership Committee.*—As is a customary procedure, the Executive Committee called on the Associate Membership Committee for its report. The following report was presented by Mr. John Speer, committee chairman:

The Associate Membership Committee held its semi-annual meeting at the Holiday Inn in Gaithersburg, Maryland during the interim Conference meeetings in January 1974. The committee would like to compliment the officers and staff for the excellent interim meetings, particularly the Special Session dealing with metrication. As an outgrowth of the session, at this annual meeting the Conference should be better able to deal with issues and problems concerning metrication which would normally have been passed on to a following Conference.

The Associate Membership Committee is pleased to continue hosting a reception for all Conference attendees. It serves an important purpose of providing an informal atmosphere for the exchange of views and thoughts on a myriad of issues.

At the general meeting a proposal was made to have the Associate Membership Committee prepare a questionnaire which could be used by associate members in evaluating the annual Conference. It should be pointed out that such an evaluation sheet would not speak to the issues and programs of the Conference, but rather the scheduling of meetings throughout the week. The Associate Membership Committee would be pleased to make avail-

able any expertise it may have in the selection of subjects and speakers for the annual Conference.

During the year the Associate Membership Committee lost a very valuable and trusted friend, C. W. "Chuck" Campbell. Chuck, who for many years gave much of himself to the operation of the Conference, passed away suddenly this spring. Chuck was admired not only for his accomplishments and contributions to the National Conference on Weights and Measures but, more importantly, for his dedication and strength of character.

6. *Other Items.*—The committee recommends that the executive secretary be empowered to appoint a committee which could assist in developing special activities related to the bicentennial year Conference.

The committee wishes to thank those delegates who attended the open meeting session and offered suggestions and comments on the items under consideration.

J. H. LEWIS, *Chairman*
L. H. DEGRANGE
L. D. DRAGHETTI
G. E. MATTIMOE
W. R. SEVIER
C. C. MORGAN
J. I. MOORE
R. E. BOWERS
A. W. FENGER
G. S. FRANKS
E. KEELEY
R. K. LORENZ
N. M. ROSS
H. E. SANDEL
J. C. STEWART
C. WOOTEN
E. H. BLACK
G. L. JOHNSON
H. F. WOLLIN, *Exec. Secy.*, NCWM

Executive Committee

(Mr. Lewis moved for adoption and, after a second from the floor, the report of the Executive Committee was adopted in its entirety by the Conference by voice vote.)

REPORT OF THE COMMITTEE ON NOMINATIONS

Presented by GEORGE L. JOHNSON, *Chairman*, Director, Division of Weights and Measures, Kentucky Department of Agriculture

(Thursday, July 11, 1974)

The Committee on Nominations met on Wednesday, July 10, 1974, for the purpose of selecting a slate of nominees for all elective offices and for the ten elective memberships of the Executive Committee. In the selection of nominees from the active membership, consideration was given to attendance records, geographical distribution, Conference participation, and other factors deemed by the committee to be important.

The Committee on Nominations submits the following names in nomination for office to serve during the ensuing year and at the 60th National Conference on Weights and Measures:

Chairman: S. D. Andrews, Florida.

Vice Chairmen: J. G. Gustafson, Minneapolis, Minnesota; E. Prideaux, Colorado; H. D. Robinson, Maine; H. E. Sandel, San Bernardino County, California.

Treasurer: C. C. Morgan, Gary, Indiana.

Chaplain: J. I. Moore, North Carolina.

Executive Committee: C. P. Conrad, New Jersey; J. A. Etzkorn, South Dakota; E. Hanish, LaPorte County, Indiana; W. B. Harper, Birmingham, Alabama; F. D. Morgan, Utah; P. E. Nichols, Alameda County, California; L. P. Romano, Monroe County, New York; R. F. Schulmeister, New Mexico; R. A. Tharalson, Minnesota; E. Whitesides, Texas.

G. L. JOHNSON, *Chairman*, Kentucky
E. H. BLACK, Ventura County, California
J. C. BOYD, Iowa
S. H. CHRISTIE, New Jersey
G. L. DELANO, Montana
J. F. LYLES, Virginia
C. C. MORGAN, Gary, Indiana

Committee on Nominations

(There being no further nominations from the floor, nominations were declared closed, and the officers nominated by the committee were elected unanimously by voice vote.)

REPORT OF THE COMMITTEE ON RESOLUTIONS

Presented by WILLIAM H. KORTH, *Chairman*, Director, Weights and Measures, Consumer Affairs, Ventura County, California

(Thursday, July 11, 1974)

The Committee on Resolutions wishes to express the appreciation of the 59th National Conference on Weights and Measures to all who contributed in any way toward the conduct of a successful meeting. A special vote of thanks is extended to the following:

1. To Dr. Richard W. Roberts, Director of the National Bureau of Standards, for his active support and recognition of the importance of weights and measures administration in the United States.

2. To Dr. Arthur O. McCoubrey, Director, Institute for Basic Standards, National Bureau of Standards, for his very interesting and informative address and his participation in the Conference Honor Awards Ceremony.

3. To the Honorable Betsy Ancker-Johnson, Assistant Secretary for Science and Technology, U.S. Department of Commerce, for her excellent keynote address and interest in the concerns of the National Conference on Weights and Measures.

4. To the Honorable Bernard Athané, Director, International Bureau of Legal Metrology, and the Honorable James A. Servin, Warden of Standards, Australia, who traveled to the United States for the express purpose of addressing the National Conference on Weights and Measures and whose presentations were outstanding.

5. To all speakers of the Conference for their valuable contributions to the program.

6. To all officers and appointed officials of the 59th National Conference on Weights and Measures for their valuable service and contributions to the functioning of an orderly and successful Conference program.

7. To all committee members for having given generously of their time and efforts during the year and in the preparation and presentation of their reports.

8. To the governing officials of all state and local jurisdictions for their manifest interest in the progress of weights and measures administration in the United States.

9. To representatives of business and industry for their liberal cooperation and hospitality.

10. To the management and staff of the Shoreham Americana Hotel for their fine facilities and many courtesies which contributed to the enjoyment and comfort of the delegates.

11. To the National Bureau of Standards, and in particular the staff of the Office of Weights and Measures, for planning and administering the many details involved in the work and program of the National Conference.

The following resolutions are presented in their entirety for consideration of the members of the Conference:

Adoption and Use of the International System of Units (SI)

Whereas the United States of America is moving toward the implementation of the International System of Units (SI) of weights and measures; and

Whereas the Congress of the United States has not enacted appropriate legislation, which the National Conference on Weights and Measures continues to support and encourage; and

Whereas the use of the International System of Units (SI) together with the customary system in net content labeling of all commodity packaging for private, public, and commercial consumption and use becomes an excellent avenue for associative learning of the International System of Units (SI); and

Whereas government departments and agencies on all levels, businesses, industries, and institutions can render a vital service of education by encouraging use of both systems in (for example) labeling, statistical reporting, blueprints, and engineering; and

Whereas the use of dual systems of weights and measures provides the appropriate opportunity for getting our nation and its jurisdictional subdivisions into the logical second step of conversion where there would be legal equality of the two systems of weights and measures: Therefore be it

Resolved, That the National Conference on Weights and Measures strongly recommends that member jurisdictions secure appropriate modification of laws, statutes, regulations, and ordinances to provide and secure the equality of the International System of Units (SI) with the customary system of weights and measures and to allow and make legal the International System of Units (SI) for all matters in which it is in the best national interest.

Adoption and Use of a National Sampling Procedure

Whereas the federal agencies of the United States of America have preempted many sectors of the package labeling field; and

Whereas these federal agencies have, or are developing, sampling plans and procedures in their various areas of responsibility; and

Whereas these numerous sampling procedures will result in confusion in the packaging industry and a significant decline in local enforcement; and

Whereas this will limit the flexibility of local agencies in the exercising of concurrent jursdiction; and

Whereas the primary purpose of package sampling is consumer protection: Therefore be it

Resolved, That the National Conference on Weights and Measures strongly recommends that the Federal Government of the United States take the immediate and necessary steps to proclaim:

1. that it is the responsibility of the National Bureau of Standards to approve and publish a single national sampling procedure for all packaged commodities;
2. that the National Bureau of Standards is to solicit recommendations from other federal agencies, state, county, and city weights and measures officials, industry representatives, and consumer groups in the development of a national sampling procedure; and
3. that the national interest would best be served by the application of a single sampling procedure on all products throughout the entire chain of distribution.

Request that the Secretary of Agriculture Defer Action on Proposed Net Weight Labeling Regulations

Whereas the 59th National Conference on Weights and Measures convened in Washington, D.C. in general assembly July 7–12; and

Whereas the National Conference on Weights and Measures is composed of members of every State, the Commonwealths, and a myriad of local jurisdictions; and

Whereas the constituent members of the National Conference represent the national community of weights and measures, whose personnel, expertise, and responsibility have been long established at State level; and

Whereas the USDA has, without adequate consultation with the weights and measures community, published proposed regulations in the Federal Register; and

Whereas the Secretary of Agriculture has now before him these regulations which, without further publication, exposure, or consultation, he may promulgate; and

Whereas there exists a preponderance of evidence that these regulations will, in fact, derogate from recommendations of this Conference's Model Law and, in fact, be detrimental to the consumer's best interest: Therefore be it

Resolved, That this Conference go on record in opposition to any proposal, however amended, which provides for less than equitable treatment for the packer and the consumer alike; and be it further

Resolved, That the Secretary of Agriculture defer any action on the regulations currently under consideration until such time as the weights and measures community has had adequate input and effective consultation which will result in a consensus and provide the public with a practical program, equitable to all; and be it further

Resolved, That the Secretary of Agriculture, in recognition of the expertise, equipment, and personnel existing in the weights and measures community, be respectfully requested to communicate with this group prior to and in anticipation of the publication of any proposed regulations involving any consumer commodity; and be it further

Resolved, That the Secretary of this Conference be instructed to supply copies of this resolution to President Nixon, Secretary of Agriculture Butz, Under Secretary Feltner, and each of the Congressional delegates to Congress.

W. H. KORTH, *Chairman*, Ventura County, California
N. BUCUR, Lake County, Indiana
R. H. HELMICK, Arizona
W. F. JUNKINS, Pennsylvania
T. E. KIRBY, Georgia
D. L. LYNCH, Kansas City, Kansas
W. J. TUSEN, New Hampshire

Committee on Resolutions

(On motion of the committee chairman, seconded from the floor, the report of the Committee on Resolutions was adopted by voice vote.)

REPORT OF THE AUDITING COMMITTEE

Presented by W. B. HARPER, *Chairman*, Chief Inspector, Bureau of Weights and Measures, Department of Inspection Services, Birmingham, Alabama

(Thursday, July 11, 1974)

The Auditing Committee on the 59th National Conference on Weights and Measures met on Wednesday, July 10, 1974, for the purpose of reviewing the financial records of the Conference treasurer, C. C. Morgan. The committee finds these records to be in accordance with the Conference procedure and correct.

W. B. HARPER, *Chairman*, Birmingham, Alabama
W. M. BAKER, Missouri
R. W. PROBST, Wisconsin
R. N. SMITH, *Staff Assistant*, NBS

Committee on Auditing

(On motion of the committee chairman, seconded from the floor, the report of the Auditing Committee was adopted by voice vote.)

REPORT OF THE TREASURER

Presented by C. C. MORGAN, Sealer of Weights and Measures, Gary, Indiana

(Thursday, July 11, 1974)

Balance on hand July 1, 1973		$ 3,141.13
RECEIPTS:		
Registrations (407 at $25.00)	$10,175.00	
Committee Meetings	1,020.00	
Subtotal		11,195.00
Total		$14,336.13
DISBURSEMENTS:		
Marine Enterprises Inc.	$ 225.00	
Robert Williams	25.00	
Artcraft Press Inc.	102.68	
Radisson Hotel Master Account	2,129.77	
Joe Jung, Orchestra	365.00	
IBM Typewriters—Rental	87.00	
S & A Lines	180.00	
Committee on Liaison with the Federal Government	1,881.64	
Committee on Specifications and Tolerances	1,772.60	
Committee on Laws and Regulations	1,269.93	
Committee on Education, Administration, and Consumer Affairs	1,460.39	
Stamps	10.00	
Franklin Press, Printing	94.50	
James Akey, Film and Flashbulbs (cash)	36.00	
Reception, Registration, Hotel Expense (cash)	298.50	
Bank Service Charges	9.89	
Subtotal		9,947.90
Balance on hand July 1, 1974		$ 4,388.23

Depository: Bank of Indiana

(Signed) C. C. MORGAN, *Treasurer*

(On motion of the treasurer, seconded from the floor, the Report of the Treasurer was adopted by the Conference.)

PERSONS ATTENDING THE CONFERENCE

State, City, and County
Weights and Measures Officials

ALABAMA

State — JOHN B. RABB, Metrologist, Weights and Measures Division, P. O. Box 3336, Montgomery 36109 (Tel. 205: 269–7722)

City Weights and Measures Officials:

Birmingham 35203 — W. B. HARPER, Chief, Weights and Measures, City Hall, Room 207 (Tel. 205: 252–0251)

Huntsville 35801 — T. E. MORGAN, Chief, Weights and Measures, Huntsville Field, Airport Road (Tel. 205: 883–8332)

ARIZONA

State — RAYMOND H. HELMICK, State Inspector, Department of Weights and Measures, 2980 Grand Avenue, Phoenix 85017 (Tel. 602: 271–5211)

ARKANSAS

State — SAM F. HINDSMAN, Director, Weights and Measures, Department of Commerce, 4608 W. 61st Street, Little Rock 72209 (Tel. 501: 371–1759)
BILLY W. SULLIVANT, Metrologist

CALIFORNIA

State — WALTER S. WATSON, Chief, Division of Measurement Standards, Department of Food and Agriculture, 8500 Fruitridge Road, Sacramento 95826 (Tel. 916: 445–7001)
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Orange — WILLIAM FITCHEN, Sealer of Weights and Measures, 1010 South Harbor Blvd., Anaheim 92805 (Tel. 714: 774–0284)

Riverside — JOSEPH W. JONES, Director, Weights and Measures, 2950 Washington Street, Riverside 92504 (Tel. 714: 787–2620)

San Bernardino — H. E. SANDEL, Director, Weights and Measures & Consumer Affairs, 160 East Sixth Street, San Bernardino 92415 (Tel. 714: 383–1411)

San Joaquin — THOMAS H. LADD, Director of Weights and Measures, P. O. Box 407, Stockton 95201 (Tel. 209: 982–4532)

San Mateo — H. E. "GENE" SMITH, Director, Weights and Measures, 702 Chestnut Street, Redwood City 94063 (Tel. 415: 364–5600, Ext. 2227)

Santa Clara — ROBERT W. HORGER, Director, Department of Weights and Measures & Consumer Affairs, 1555 Berger Drive, San Jose 95112 (Tel. 408: 299–2105)

Ventura ——— EVERETT H. BLACK, Administrator, Consumer Protection Agency, 666 El Rio Drive, Oxnard 93030 (Tel. 805: 487–5511, Ext. 4460)
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COLORADO

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MILTON D. SCHNEIDER, State Inspector of Oils, Colorado Division of Labor, 1024 Speer Blvd., Denver 80203 (Tel. 303. 892–2096)

CONNECTICUT

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Middletown 06457 ——— GUY J. TOMMASI, Sealer, City Hall (Tel. 203: 347–4671)

Stamford 06901 ——— ALFONS KOZIOL, Sealer, City Hall (Tel. 203: 348–5841, Ext. 274)

DELAWARE

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DISTRICT OF COLUMBIA

District ——— KENNETH G. HAYDEN, Chief, Division of Weights and Measures, Bureau of Building, Housing, and Zoning, Department of Economic Development, 1110 U St., S.E., Washington, D.C. 20020 (Tel. 202: 629–4662)
DAVID K. FORBES, Supervisor

FLORIDA

State ——— SYDNEY D. ANDREWS, Director, Division of Standards, Department of Agriculture and Consumer Services, Mayo Building, Tallahassee 32304 (Tel. 904: 877–8161, Ext. 146)
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GEORGIA

State ——— THOMAS E. KIRBY, Director, Weights and Measures Laboratory, Department of Agriculture, Forest Park 30349 (Tel. 404: 361–6764)

O. D. MULLINAX, Director of Fuel and Measures, Department of Agriculture, Agriculture Building, Capitol Square, Atlanta 30334 (Tel. 404: 656–3605)

HAWAII

State ——— GEORGE E. MATTIMOE, Deputy Director of Weights and Measures, Department of Agriculture, 1428 S. King Street, P. O. Box 5425, Honolulu 96814 (Tel. 808: 941–3071)

IDAHO

State ——— LYMAN D. HOLLOWAY, Supervisor, Division of Weights and Measures, Department of Agriculture, 2126 Warm Springs Avenue, Boise 83702 (Tel. 208: 384–2345)

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State ——— MURVIL D. HARPSTER, Chief, Bureau of Products Inspection and Standards, Department of Agriculture, 531 E. Sangamon Avenue, Springfield 62706 (Tel. 217: 782–7655)
RUSSELL OGG, FSS Inspector II, Bureau of Products Inspection and Standards

City Weights and Measures Officials:

Chicago 60602 ——— THEODORE R. HELLER, Supervising Consumer Service Officer, Department of Consumer Sales, Weights and Measures, Room 808, City Hall, 121 North La Salle Street (Tel. 312: 744–4092)
HERBERT RIEDERER, Supervising Consumer Service Officer
JOSEPH SILKA, Consumer Service Officer II

INDIANA

State ——— LORENZO A. GREDY, Director, Weights and Measures, State Board of Health, 1330 West Michigan Street, Indianapolis 46206 (Tel. 317: 633–6860)
JOHN E. BASHAM, Supervisor, Sanitary Bedding Section, Division of Weights and Measures

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Gibson ——— W. R. SEVIER, Inspector of Weights and Measures, Court House Annex, Princeton 47670 (Tel. 812: 385–2426)

Grant ——— GEORGE W. SHARP, Deputy Director of Weights and Measures, Grant County Courthouse, Marion 46952 (Tel. 317: 664–9974)

Lake ——— NICHOLAS BUCUR, Sealer of Weights and Measures, 400 North Lake Park Avenue, Apt. 10, Oxford West, Hobart 46342 (Tel. 219: 942–4455)

La Porte ——— EDWIN HANISH, Inspector of Weights and Measures, 2702 Franklin Street, Michigan City 46360 (Tel. 219: 879–9486)

Madison ——— CHARLES W. MOORE, Inspector of Weights and Measures, Madison County Government Building, Lapel 46051 (Tel. 317: 534–3328)

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St. Joseph ——— CHESTER S. ZMUDZINSKI, Inspector of Weights and Measures, County/City Building, 227 W. Jefferson Blvd., South Bend 46601 (Tel. 219: 284–9751)

Tippecanoe ——— WEBSTER MCMURRY, Inspector of Weights and Measures, P. O. Box 444, LaFayette 47902 (Tel. 317: 742–0626)

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City Weights and Measures Officials:

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East Chicago 46312 ——— THAD A. BOGUSZ, Inspector of Weights and Measures, 4713 Northcote Avenue (Tel. 219: 397–0073)

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JAMES M. DOUGLAS, Deputy Inspector
RALPH HANNAH, Deputy Inspector
JOE ROBERTS, Deputy Inspector

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IOWA

State ——— J. CLAIR BOYD, Supervisor, Weights and Measures Division, Department of Agriculture, Capitol Building, Des Moines 50319 (Tel. 515: 281–5716)

KANSAS

State ——— JOHN L. O'NEILL, Sealer, Weights and Measures Division, State Board of Agriculture, State Office Building, Topeka 66612 (Tel. 913: 296–3846)

City Weights and Measures Officials:

Kansas City 66101 ——— DONALD L. LYNCH, Chief, Weights and Measures, Municipal Office Building, 701 North 7th Street (Tel. 913: 371–2000, Ext. 212)

KENTUCKY

State ——— GEORGE L. JOHNSON, Director, Division of Weights and Measures, Department of Agriculture, 106 West Second Street, Frankfort 40601 (Tel. 502: 564–4870)
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LOUISIANA

State ——— CHARLES S. JOHNSON, Assistant Director of Weights and Measures, Department of Agriculture, P. O. Box 44292, Capitol Station, Baton Rouge 70804 (Tel. 504: 389–5168)

MAINE

State — HARLON D. ROBINSON, Deputy State Sealer, Bureau of Weights and Measures, Department of Agriculture, State Office Building, Augusta 04330 (Tel. 207: 289–3841)
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MARYLAND

State — RICHARD L. THOMPSON, Chief, Weights and Measures, Department of Agriculture, University of Maryland, Symons Hall, Room 3205, College Park 20742 (Tel. 391: 454–3551)
LACY H. DEGRANGE, Field Supervisor

County Weights and Measures Officials:

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Prince George's — ROBERT J. CORD, Chief, Weights and Measures Division, County Service Building, Hyattsville 20781 (Tel. 301: 779–3850)
MELVIN L. MATTHEWS, Deputy Inspector
ROY D. O'CONNOR, Deputy Inspector

MASSACHUSETTS

State — EDWARD H. STADOLNIK, Head Administrative Assistant, Division of Standards, Executive Office of Consumer Affairs, State House, Room 194, Boston 02133 (Tel. 617: 727–3482)

City Weights and Measures Officials:

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Everett 02149 — LAWRENCE L. ELLIOTT, Inspector, Room 27, City Hall (Tel. 617: 389–2100, Ext. 20 and 21)

Fitchburg 01420 — WILFRED T. DELOGE, Inspector, City Hall, Main Street (Tel. 617: 343–7012)

New Bedford 02740 — FRANK E. PRZYBYSZEWSKI, Deputy Sealer, 306 Liberty Street (Tel. 617: 993–2454)

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MICHIGAN

State — RONALD M. LEACH, Chief, Food Inspection Division, Department of Agriculture, Lewis Cass Building, 5th Floor, Lansing 48913 (Tel. 517: 373–1060)
JACK HARTZELL, General Supervisor
RAYMOND HANKEY, Food Inspector, 12481 15½ Mile Road, Marshall 49068 (Tel. 616: 781–3448)

County Weights and Measures Officials:

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City Weights and Measures Officials:

Dearborn 48120 — JAMES A. HUGHES, Director of Licenses, Weights and Measures, 2951 Greenfield Road (Tel. 313: 548–8501)

MINNESOTA

State — WARREN E. CZAIA, Director Division of Weights and Measures, Department of Public Service, 1015 Currie Avenue, Minneapolis 55403 (Tel. 612: 333–3249)

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ARVID W. FENGER, Senior Weights and Measures Inspector
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City Weights and Measures Officials:

Minneapolis 55415 ____JOHN G. GUSTAFSON, Director of Consumer Services and Licenses, Room 101A, City Hall (Tel. 612: 348–2080)

MISSISSIPPI

State_____JOE B. HARDY, JR., Director, Consumer Protection Division, Department of Agriculture and Commerce, State Office Bldg., P. O. Box 1609, Jackson 39205 (Tel. 601: 354–6258)

MISSOURI

State_____J. W. ABBOTT, Director, Weights and Measures, Department of Agriculture, P. O. Box 630, Jefferson City 65101 (Tel. 314: 751–3440)
WILLIAM M. BAKER, Program Supervisor, Weights and Measures Division

City Weights and Measures Officials:

St. Louis 63104 _____DANIEL I. OFFNER, Commissioner of Weights and Measures, 1220 Carr Lane Avenue, Room 145 (Tel. 314: 453–3251)

MONTANA

State_____GARY L. DELANO, Administrator, Division of Weights and Measures, Department of Business Regulation, 804 North Main, Helena 59601 (Tel. 406: 449–3163, Ext. 8)

NEBRASKA

State_____ROGER SANDMAN, Assistant Director, Department of Agriculture, P. O. Box 94695, State House Station, Lincoln 68509 (Tel. 402: 471–2341)
STEVE MALONE, Administrator, Weights and Measures (Tel. 402: 471–2536)

City Weights and Measures Officials:

Omaha 68102 _____NORMAN M. ROSS, Chief, Weights and Measures Section, City Hall, 108 South 18th Street (Tel. 402: 341–8122, Ext. 245)

NEW HAMPSHIRE

State_____WALTER J. TUSEN, Chief Inspector, Bureau of Weights and Measures, Division of Markets and Standards, Department of Agriculture, State House Annex, Concord 03301 (Tel. 603: 271–3700)

NEW JERSEY

State_____SAMUEL H. CHRISTIE, JR., State Superintendent of Weights and Measures, Division of Consumer Affairs, Department of Law and Public Safety, 187 W. Hanover Street, Trenton 08625 (Tel. 609: 292–4615)
JAMES R. BIRD, Deputy State Superintendent
CARL P. CONRAD, JR., Supervisor of Licensing

County Weights and Measures Officials:

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Camden — A. J. FRANCESCONI, Superintendent of Weights and Measures, Court House, Room 306, Camden 08101 (Tel. 609: 964–0242)

Cape May — A. DAVID GIDDING, Superintendent of Weights and Measures, 6807 Seaview Avenue, Wildwood Crest 08260 (Tel. 609: 522–4861)

Cumberland — GEORGE S. FRANKS, Superintendent of Weights and Measures, 800 East Commerce Street, Bridgeton 08302 (Tel. 609: 451–8000, Ext. 296)
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Essex — WILLIAM C. LESINO, Superintendent of Weights and Measures, 520 Belleville Ave., Belleville 07109 (Tel. 201: 961–7633)

Gloucester — ROBERT J. MORRIS, Superintendent of Weights and Measures, County Building, 49 Wood Street, Woodbury 08096 (Tel. 609: 845–1600)
JOSEPH SILVESTRO, Assistant Superintendent

Mercer — RALPH M. BODENWEISER, Superintendent of Weights and Measures, Administration Building, 640 S. Broad Street, Trenton 08607 (Tel. 609: 989–8000)

Middlesex — JOHN M. CHOHAMIN, Superintendent, Department of Weights and Measures, 103 Bayard Street, New Brunswick 08901 (Tel. 201: 246–6297)

Monmouth — WILLIAM I. THOMPSON, Superintendent of Weights and Measures, Hall of Records, Freehold 07728 (Tel. 201: 431–4000, Ext. 401)

Warren — GERALD E. CONNOLLY, Superintendent, Court House, Belvidere 07823 (Tel. 201: 475–5087)
JAMES P. BURNS, Deputy Superintendent

City Weights and Measures Officials:

Kearny 07032 — JAMES POLLOCK, Municipal Superintendent, Town Hall, 402 Kearny Avenue (Tel. 201: 991–2700)

Paterson 07505 — WILLIAM J. KEHOE, Superintendent, 115 Van Houten Street (Tel. 201: 684–3430)

Trenton 08608 — RICHARD J. BONEY, Superintendent, Trenton Civic Center, Armory Drive (Tel. 609: 392–3341, Ext. 360)

NEW MEXICO

State — RICHARD F. SCHULMEISTER, Inspector and Metrologist, Weights and Measures, Department of Agriculture, P. O. Box 3170, Las Cruces 88003 (Tel. 505: 646–1616)

NEW YORK

State — J. F. TUCKER, Director, Bureau of Weights and Measures, Department of Agriculture and Markets, 1220 Washington Avenue, Albany 12226 (Tel. 518: 457–3452)

NORTH CAROLINA

State — JOHN I. MOORE, Superintendent, Division of Weights and Measures, Department of Agriculture, P. O. Box 27647, Raleigh 27611 (Tel. 919: 829–3313)

MARION L. KINLAW, Supervisor
PARLEY B. RASMUSSEN, Chemist (Tel. 904:425-2044)
RAY DEWITT SIGMON, Gasoline and Oil Inspector, Department of Agriculture, 321 McClure Circle, Charlotte 28216 (Tel. 704: 392-5682)

OHIO

State — MARK R. LIST, Deputy Director, Department of Agriculture, 9000 E. Main Street, Reynoldsburg 43068 (Tel. 614: 866-6361)
ROJER E. BOWERS, Chief, Division of Weights and Measures

County Weights and Measures Officials:
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City Weights and Measures Officials:
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Cleveland 44113 — JOHN S. PILCH, Commissioner, Markets, Weights and Measures, West Side Market, 1979 West 25th Street (Tel. 216: 694-3386)
Dayton 45402 — LEON MILLER, Sealer, 960 Ottawa Street (Tel. 513: 225-5304)

OKLAHOMA

State — H. K. SHARP, Assistant Director, Marketing Division, Department of Agriculture, 122 Capitol Building, Oklahoma City 73105 (Tel. 405: 521-3861)

OREGON

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