Attacking the
Fire Problem:
A Plan for
ACTION
Center for Fire Research
The Office of Standards and Technology is responsible for developing and implementing policies and procedures for the use of technology in building codes and standards. The Office also provides technical assistance and guidance to other government agencies and to the private sector on the use of technology in building codes and standards.
PREFACE

On October 29, 1974, President Ford signed into law the Federal Fire Prevention and Control Act of 1974. This legislation is the direct result of the findings of the President's Commission on Fire Prevention and Control, and it reflects the Commission's findings that America's fire losses are disgraceful and totally unacceptable to a country whose level of technology and human resources is the highest in the world.

The Congress intended the Federal Fire Prevention and Control Act of 1974 to provide new impetus to solving the Nation's fire problem. In addition to creating the National Fire Prevention and Control Administration within the Department of Commerce, the Act provides for the establishment of a separate Fire Research Center (CFR) at the National Bureau of Standards. The Fire Research Center is charged with understanding fundamental processes of fire, including its physics and chemistry; its behavior, spread and growth in buildings; the fire hazards uniquely arising from transportation of combustible fluids and materials; and design concepts for increased fire safety in the built environment. Further, the Congress authorized the Fire Research Center to carry out investigations into the biological, physiological, and psychological factors affecting the victims of fire. In particular, the biological and physiological effects of toxic substances on fire victims, and the psychological and motivational characteristics induced either by fire stress or fire trauma are to be systematically studied for the first time.

Thus, the Congress has created within the National Bureau of Standards a Fire Research Center with a broad mandate for understanding fire and its myriad effects, and for reducing the unconscionable losses which attend it.
To reduce fire losses by 50%, the following goals are set:

1. Fire Safety Engineering
2. Fire Science

- Fire Prevention
- Fire Control
- Fire Detection & Design
- Construction
- Construction Products & Systems
- Fire Products
- Fire Finishing
- Physics & Dynamics
- Toxicology of Combustion Products
- Chemistry
- Hazard Analysis
- Information & Technology

A plan for action attacking the fire problem is described.
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Abstract
The goal of the Center for Fire Research is to insure the development of the technical base for the standards and specifications needed in support of the National goal to reduce fire losses by 50% over the next generation.
Unwanted fire reaps a grim toll in the United States. Each year more than twelve thousand of our citizens die in fires and several hundred thousand more suffer serious burn injuries. In addition to this human suffering, property damage drains some eleven billion dollars from our economy. These figures, stark in themselves, are all the more shocking when they are contrasted with figures from other industrialized countries. For example, Japan reports 0.61 fires for each thousand persons as compared to 13.0 for the United States. Japan has 14.2 fire deaths for each million persons vs. 57.1 in the United States. Figures can be recited for several European countries to the same effect. While the statistical basis for these figures is less than perfect, the unfavorable position of the United States seems beyond dispute.

No one knows why our Nation's losses are so great, although some of the very characteristics which make the United States unique may also contribute to the problem. For example, our homes are generally of wood construction, as compared to the stone and concrete commonly used in Western Europe, and they are replete with plush furnishings. Further, there is some correlation between energy consumption and fire incidence. An important social factor is the attitudes people have: in the United States we view fire as a misfortune or an unavoidable accident, while Japan deals with the fact of having a fire as a felony.

Despite the fact that unwanted fires are complex phenomena with cause and effect poorly understood, simplistic solutions abound. Some call for intense public education as the only answer, on the assumption that most fires are caused by people. Others believe that using such devices as automatic sprinklers in all occupancies will solve the Fire Problem. Yet, both of these approaches have their limitations. For example, much of human behavior, especially that of infants, the very old, and the mentally handicapped, is uncontrollable. The victims of this behavior may be other innocent persons, perhaps asleep in neighboring rooms. We must deal with the problem on the assumption that people will, on occasion, be careless and that accidents will happen.

Yet, life safety is often endangered well before a fire reaches the detectable threshold for sprinkler systems, however reliable they may be. Therefore, it should be clear that a single remedy for the entire scope of the Fire Problem does not exist or, if it does, it will only be uncovered by further research.

The National Bureau of Standards has been the Nation's fire research laboratory for over five decades; our laboratory facilities for fire research are excellent. The staff cooperates closely with individuals and groups at home and abroad who are working to decrease fire losses. The National Fire Prevention and Control Administration, the fire services, the Congress, various universities, the National Fire Protection Association, building code officials and voluntary standards organizations share with us the challenge to make our environment safer from the ravages of fire.

We are just now gaining a measure of quantitative understanding of fire phenomena. Fire technology is moving slowly from childhood to adolescence, but it is a long way from being a mature science. Nevertheless, action on fire cannot wait for a total understanding of the appropriate physical and chemical phenomena. The world demands, now, criteria and recommended practices for controlling fire hazards. In short, an attack on the problem is needed!

Only a balanced approach will provide interim solutions that are both technically sound and immediately applicable. Fire science—its chemistry and physics—and statistical analysis of fire incidence serve as inputs and guides. Fire safety engineering transforms these inputs into the tools the Nation needs to reduce fire loss. The National Bureau of Standards (NBS) directs the results of all these activities to the agencies and organizations with authority to set standards and specifications.

2Ibid.
While the urgency of the Fire Problem cannot be under-

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Attacking the Fire Problem

Center for Fire Research

Accidental fire is the result of complex physical phenomena and human action. The first task in a program for loss reduction is understanding each component of an accidental fire.

One begins by analyzing fire incident data to reveal how fire accidents happen and to spotlight areas which can be impacted by research. This task falls to the Office of Information and Hazard Analysis. Solutions to these problems lie in the fundamental knowledge of fire processes. Broadening our knowledge of flame physics, flame chemistry, and flame retardants is the assignment of the Program for Chemistry, the Program for Toxicology of Combustion Products, and the Program for Physics and Dynamics.

Only when we have an understanding of the physical and human causes of fire incidents can we begin to formulate solutions to the Fire Problem.

The fire community.

Provide technical information services for the CPR staff and
provide a central repository for fire research literature and to
model for more quantitative hazard characterization.

Objectives: To characterize fire hazards as part of the form-

Analysis and Hazard Information
Office of
Office of Information and Hazard Analysis
Benjamin Buchbinder, Acting Chief

Current Activities:

- In depth hazard analysis projects in selected problem areas (such as fires involving plastics and apparel) are underway. These projects combine case history investigations of fire accidents, laboratory experimentation, fire testing, and data analysis to identify and characterize specific hazards.

- Studies are being conducted in support of the development of a general apparel flammability standard, including hazard characterization and the recommendation of test methods related to real-world experience.

- A hazard quantification study is in process, encompassing probabilistic model development. Consideration is being given to more quantitative characterization of the fire hazard to compartments and buildings as well as to individual products.

- An analysis of burn injuries from apparel fires is being made, which considers the reactions of victims as well as the composition and shape of the garments.

- A central repository is maintained for fire research literature. Technical information services are provided in support of the fire research program.

Office of Information and Hazard Analysis--Selected Publications:


Chemistry Program for

...
Program for Chemistry  
Clayton Huggett, Chief

Current Activities:

- The structure of typical flames, including flames containing chemical retardants, is being studied experimentally by mass spectrometric and optical techniques and theoretically through thermodynamic and kinetic calculations.

- Research grants study chemical kinetics and flame dynamics and develop models of flames and flame inhibition.

- The chemistry and methods of controlling cellulosic fires are being studied for CFR at the University of Montana.

- Clemson University is studying flame retardation mechanisms in fabrics with partial support of CFR.

- With CFR support, the University of Maryland is investigating hydroxyl radical reactions of fundamental importance to flame initiation and propagation.

- Thermodynamic quantities associated with the pyrolysis and stepwise combustion of polymers are being measured experimentally.

- The significance of the oxygen index as a measure of flammability is under investigation.

- The relationship between flammability limits in premixed flames and the oxygen index in diffusion flames is being explored.

- Conditions which can lead to flash fires in compartments are being defined. A method to evaluate the flash fire potential of solid fuels is under development.

- Laser-optical methods are being developed which will detect the presence of high-energy, short-lived intermediates present in flames.

Chemistry--Selected Publications:


Program for Toxicology of Combustion Products
Merritt Birky, Acting Chief

Current Activities

- Major components in combustion samples are quantitatively determined using gas chromatographic, infrared spectroscopic, and wet chemical techniques.
- Analytical measurements of specific toxicants are being correlated with animal behavior and blood chemistry to determine toxicity hazard.
- Correlation of laboratory and full-scale smoke and gas measurements will be made.
- Under CFR grants, the University of Pittsburgh and the University of Utah are conducting biomedical studies to assess the toxicity of combustion products from a variety of materials using laboratory-scale experiments.
- CFR is supporting work at the Applied Physics Laboratory of Johns Hopkins University which is working with the Maryland State Medical Examiner's Office to determine the causes of deaths in fires in the State of Maryland.

Toxicology of Combustion Products--Selected Publications:


Objectives: to analyze ignition, fire spread, and hot gas circulation; to determine the dominant controlling mechanisms and to relate them to fire hazard results; to characterize smoke aerosols; to relate smoke properties to fire behavior; to determine the dominant factors controlling smoldering combustion.
Program for Physics and Dynamics  
John Rockett, Chief

Current Activities:

- Radiative ignition of solids is being studied utilizing a CO₂ laser to simulate fire heat fluxes.
- Mathematical modeling of the ignition process is being carried out.
- Smoldering of cellulosic and polyurethane foam materials is being studied to define the mechanisms of smoldering combustion and to develop methods of inhibiting smolder.
- A laboratory-scale model corridor test facility is being used to investigate the partial scaling relationships in simulating full-scale corridor fire spread.
- Fire induced flows in enclosures and in turbulent flames are being studied, and advanced turbulent flow models are being developed to predict these flows.
- The physical characteristics of smoke are being measured; the mechanisms by which these characteristics change as the smoke ages are being studied.
- A laboratory experiment has been initiated to study the ability of a corridor sprinkler to suppress a fire in an adjacent room.

Physics and Dynamics--Selected Publications:


11. Quintiere, J., A Characterization and Analysis of NBS Corridor Fire Experiments in Order to Evaluate the Behavior and Performance of Floor Covering Materials, National Bureau of Standards (U.S.), NBSIR 75-691 (June 1975), NTIS Order No. COM-75-11015; $4.75.

Fire Research Center for Problem the Fire Attacking


Completion, Fire Control - Furnishings, Fire Control - Construct.

are the results of the Programs for Fire Prevention - Pro-

duced practices for products and construction assemblies.

Improved laboratory test methods, procedures, and recom-

early that generated by the NBS Fire Science Programs.

depends on the use of new fundamental knowledge, particu-

are problem areas generally.

Fire Safety Engineering addresses the solution of real.
Safety Commission

Ducks, particularly in support of the Consumer Product

Objectives: To develop and recommend standards or other

Fire Prevention

Program for

Products
Program for Fire Prevention - Products
James Winger, Chief

Current Activities:

- Flammability test methods are being developed and evaluated for use in a standard for upholstered furniture.
- The University of Maryland, under a CFR research grant, is studying ease of extinguishment of apparel fabrics.
- Test method development for the flammability of general apparel is underway.
- The flammability of various consumer products such as Christmas decorations and Easter grass is being studied so that flammability tests can be developed.
- Studies on the effects of laundering, dry cleaning, garment construction, and other variables on garment flammability are proceeding.

Fire Prevention - Products -- Selected Publications:


Objectives: To characterize the fire hazards of interior fur-

Finishings: Fire Control Program for
Program for Fire Control - Furnishings
Sanford Davis, Chief

Current Activities:

- Full-scale fires of interior furnishings are conducted to study the hazards of individual pieces of furniture. The development of a hazard index is in progress.

- The development of an ease-of-ignition test for thermoplastic materials and for interior furnishing materials, in general, is underway.

- The rate of heat release and total energy from small ignition sources are being determined.

- Correlation of smoke measurements from fires of full-scale furnishings is being made with small-scale chamber tests.

- Test methods are under development for measuring rate of burning and surface flame spread of furnishing materials.

Fire Control - Furnishings--Selected Publications:


Objectives:
- To study the flammability characteristics and fire performance of construction materials and assemblies.
- To develop test methods for various building components.
- To develop models to predict the course of fire in buildings.
Program for Fire Control - Construction
Daniel Gross, Acting Chief

Current Activities:

- A fire endurance furnace capable of testing structural wall, floor/ceiling, and column assemblies is being completed.
- The effect of the properties of interior finish materials on fire growth in residential and shipboard occupancies is being studied.
- The rate of heat release of wood, plastic, and other construction materials is being studied using calorimetric techniques.
- Mathematical models are being developed to predict fire growth in rooms.
- Fire loads in buildings are being surveyed to update basic data for building codes.
- Reduced scale modeling of room fires is being conducted.
- A versatile flame spread test for multiple configurations (wall, floor, ceiling) is being developed.
- A methodology is being developed for establishing and evaluating new fire test methods dealing with ease of ignition and flame spread.
- Fire growth in mobile homes is being studied.
- Realistic thermal restraint during fire tests of floor and roof assemblies is being studied for CFR by the Portland Cement Association.

Fire Control - Construction—Selected Publications:


Objectives: to develop performance criteria for residential smoke detection devices and systems... to develop design re-

Fire Detection Systems
and Control Program for
Program for Fire Detection and Control Systems
Richard Bright, Acting Chief

Current Activities:

- Laboratory and field performance tests are being conducted on smoke detectors to outline requirements to be included in future standards.
- Patterns of heat flow in corridors from room fires and water flow rates are being studied to determine the most effective types of sprinklers for various fires.
- A design model is being developed to allow a rational base for corridor sprinkler protection.
- Proposed performance criteria are being prepared for smoke detection devices to assure consistent quality of detectors available to the consumer.
- A computer analysis for modeling smoke movement in buildings is being developed and will be used in conjunction with a gas tracer technique to depict smoke movement.
- Under CFR contract, Integrated Systems is carrying out simulation studies on air movement and smoke diffusion.
- The Illinois Institute of Technology Research Institute is studying detector sensitivity and siting requirements for dwellings, under CFR contract.
- Studies are being conducted on the performance of automatic sprinkler systems and fire detection systems for fires in health care occupancies.

Fire Detection and Control Systems--Selected Publications:

Program for Design Concepts
Harold Nelson, Chief

Current Activities:

- Studies, research, and tests are being conducted to develop a scientific base of knowledge of fire safety for rational approaches to life safety in institutions and other occupancies.

- A decision analysis study is underway to qualify and quantify hazard-producing and hazard-controlling elements to establish a logic mechanism to achieve optimum safety effectiveness, cost effectiveness, and design flexibility.

- Tests, analyses, and studies are being conducted to improve the ability to predict probable growth rates and ultimate severities of fires in rooms and the impact of these on various types of materials, furnishings, finishes, and arrangements.

- Studies are underway to find recurrent patterns of behavior for individuals and groups which can be used in the development of regulations or which can provide guidance in building design.

- Studies are being undertaken involving human factor laboratory investigations and other studies to determine means and methods of emergency alarm and communication devices, systems, and methodologies.

- Tests and evaluations are included to determine the most practical, reliable, and effective means to control smoke movement in both small and large structures.

- Tests and studies are being conducted to cover all aspects of design, usage, capabilities, and cost optimization of automatic sprinkler installations in low hazard occupancies such as hospital rooms, school rooms, or offices.
Fire Research Center for Problem the Fire Attacking Organizations Standards Into Practice Results
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American Society for Testing and Materials (ASTM)

Appendix B

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SC E5.91 Editorial
SC E5.92 TAG ISO/TC 92 International Standards

E-39 Fire Hazard Standards
SC E39.04 Recommended Practices
SC E39.10 Division of Planning and Research
TG Integration of Research Data
TG Compartment Fire Hazards
SC E39.2003 Building Furnishings or Contents
SC E39.2005 Wearing Apparel
SC E39.2008 Transportation Facilities

F-7 Aerospace Industry Methods
SC F7.06 Flammability

G-4 Behavior of Materials in O₂ Distribution Systems

National Fire Protection Association (NFPA)

Safety to Life
Sec. Committee on Means of Egress
Sec. Committee on Residential Occupancies
Sec. Committee on Health Care Facilities
Sec. Committee on Extinguishing Systems

Exposure Fire Protection
Static Electricity
Fire Tests

D. Gross
D. Gross
A. Robertson
I. Benjamin

J. Lyons
I. Benjamin - Alt.

I. Benjamin

J. Lyons
D. Gross
I. Benjamin
W. Parker

S. Davis

J. Krasny
S. Davis

D. Gross
D. Gross

C. Huggett

I. Benjamin
I. Benjamin
I. Benjamin
H. Shoub
R. Bright
H. Nelson
R. Custer
A. Robertson
A. Robertson
I. Benjamin
Information Council on Fabric Flammability (ICFF)
Research and Testing J. Krasny

Fire and Blast 8 H. Nelson

International Conference of Building Officials (ICBO)
Fire and Life Safety I. Benjamin

Intergovernmental Maritime Consultative Organization (IMCO)
Fire Protection/Fire Tests A. Robertson

International Standards Organization (ISO)
ISO/TC 92 Fire Tests on Building Materials and Structures
WG 2 Noncombustibility & Heat Release I. Benjamin
WG 3 Door Assemblies D. Gross
WG 4 Reaction to Fire A. Robertson
WG 7 Coordination & Planning
WG 10 Measuring Instruments
WG 11 Fire Resistance Tests

ISO/TC 21 Equipment for Fire Protection & Fire Fighting
WG 1 Automatic Sprinklers R. Custer

ISO/TC 38/SC 19 Burning Behavior of Textiles
WG 2 Apparel J. Winger
WG 3 Furnishings J. Winger
WG 5 Floor, Wall, & Ceiling Coverings J. Winger
WG 6 Risk Data Analysis J. Winger

Model Code Conferences and Organizations
Model Code Standardization Council I. Benjamin

Products Research Committee (PRC) J. Lyons
A. Robertson

U.S. Coast Guard

R. Fung

TC 5.6 Fire and Smoke Safety

American Society for Heating, Refrigeration, Air-Conditioning Engineers (ASHRAE)

L. Benjamini

Fire Safety Standards

Task Group on Fire Protection

American Society of Civil Engineers (ASCE)

L. Issen

Fire Resistance and Fire Protection Structures 216

American Concrete Institute (ACI)

J. Krasny

Fire Resistance and Fire Resistance

American Association of Textile Chemists and Colorists (AATCC)

J. Rockel

Research

H. Nelson

Measurement of Fire Phenomena

Executive

H. Nelson

Society of Fire Protection Engineers (SFPE)

C. Huggell

Fire Hazards in O2 Enriched Atmospheres

S. Davis

Rapid Rail Transit

H. Nelson

Systems Concepts for Fire Protection in Structures

H. Nelson

Building Construction

R. Custer

Records Protection

H. Nelson

AD Hoc Standards Development

Linde (UL)
APPENDIX C
Measures of Success - Accomplishments in FY 1975

Information and Hazard Analysis:
- A hazard analysis project was initiated to survey the fire hazards of plastics.
- The pilot implementation of the National Fire Data System was completed and transferred to the National Fire Prevention and Control Administration.
- Studies were completed on the effect of human activity and garment characteristics on the severity of injuries from apparel fires.
- Full-scale fire tests on draperies were performed as a part of a hazard characterization process.

Chemistry:
- A relationship between flammability limits in pre-mixed flames and diffusion flames was established.
- The oxygen index of liquids was studied as a function of temperature, providing new insight into the significance of the oxygen index as a measure of fire behavior.
- A prototype system for measuring the flash fire potential of aircraft interior materials was constructed.
- A computer model of a laminar diffusion flame was developed and used to study flame inhibition processes.
- A new phosphorus-containing species thought to be important in gas phase flame inhibition was identified.

Physics and Dynamics:
- A study of flame spread over thin inclined cellulosic sheets was completed.
- Preliminary results from studies of smoldering polyurethane foams indicate a high degree of correlation between smoldering and charring tendencies.
- Methodology was developed for applying test method results to determine the potential flame spread of floor coverings in building corridors.
- Recirculating fire induced flows were measured in both small-scale and full-scale corridors.
- The capability for measuring the particle size distribution and mass concentration of smoke was developed.
- A laboratory automation program was begun with the selection of a minicomputer system and the establishment of a computer operations staff within the Center.

Fire Prevention - Products:
- Standard for the Flammability of Children's Sleepwear, Sizes 7-14, went into effect May 1, 1975.
- A proposed standard for the flammability of upholstered furniture was drafted and recommended to the Consumer Product Safety Commission.
- A study of the effects of dry cleaning on the flammability of apparel fabrics was completed, and a tentative dry cleaning test procedure was developed.
- The durability of flame retardant cotton batting which is used in mattresses was studied.
- A project to study the flammability of flight attendant uniforms for the Federal Aviation Administration was completed.
- An improved test method for the flammability of powders, pastes, and granules was developed.
- A new test concept for measuring the flammability of apparel was developed.

Fire Control - Furnishings:
- A flooring radiant panel test was developed for measuring the flame spread of flooring systems used in corridors and exitways of regulated occupancies. The test is now being adopted by government agencies and industry.
- The fire safety of interior components of AM general buses and METRO subway cars was evaluated for the Washington Metropolitan Area Transit Authority.
- A burn room facility for evaluating the hazards of interior furnishings involved in fire was designed and instrumented. A study of parsons tables was completed in this facility.
Smoke control measures in two Federal high-rise office buildings were

Smoke movement and control were studied in five VA hospitals.

Sprinkler systems were completed.

Studies of automatic sprinkler discharge patterns for corridor

Underwriters Laboratories, Inc. adopted and published a proposed standard for single-station smoke

The suggested performance standards for single-station smoke detectors were adopted and published.

Fire Detection and Control Systems:

Plastics were investigated using the NBS heat release rate calorimeter.

The heat release rates of fire retardant treated wood products and foam

Standard 220, National Fire Protection Association

National Building Code and National Fire Protection Association

The Potential Heat Release Method was adopted by reference in the

Growth in rooms were developed and tested.

Reduced scale and an analytical modeling techniques for predicting fire

A report on the contribution of interior finish materials to the building

A report on the contribution of interior finish materials to the building

A report on the contribution of interior finish materials to the building

A comprehensive summary of fire endurance tests on walls con-

Fire Control - Construction:

A technique for measuring the smoke generation of thermoplastic

Fire Control - Furnishings:

A technique for measuring the smoke generation of thermoplastic

### Title and Subtitle

Fredric B. Clarke and Deborah Woolf Raisher, Editors

### Performing Organization Name and Address

**NATIONAL BUREAU OF STANDARDS**  
**DEPARTMENT OF COMMERCE**  
**WASHINGTON, D.C. 20234**

### Sponsoring Organization Name and Complete Address (Street, City, State, ZIP)

Same as No. 9

### Supplementary Notes


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### Abstract

The mission of the Center for Fire Research is to insure the development of the technical base for the standards and specifications needed in support of the National goal to reduce fire losses by 50% over the next generation. A systems approach to accomplish this mission is described. The Center consists of four basic programs in the area of Fire Science and five applied research programs in the area of Fire Safety Engineering. Each applied program addresses an aspect of the Fire Problem, using fundamental information supplied by the basic research function. Active participation by staff members in voluntary standards organizations is the principal means of making this technology available for codes and standards needed to reduce the Nation's fire loss.

### Key Words

Building design; consumer protection; fire control; fire detection; fire research; fire spread; flammability.

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- **UNCLASSIFIED**

### No. of Pages

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NBS TECHNICAL PUBLICATIONS

PERIODICALS

JOURNAL OF RESEARCH reports National Bureau of Standards research and development in physics, mathematics, and chemistry. It is published in two sections, available separately:

• Physics and Chemistry (Section A)

Papers of interest primarily to scientists working in these fields. This section covers a broad range of physical and chemical research, with major emphasis on standards of physical measurement, fundamental constants, and properties of matter. Issued six times a year. Annual subscription: Domestic, $17.00; Foreign, $21.25.

• Mathematical Sciences (Section B)

Studies and compilations designed mainly for the mathematician and theoretical physicist. Topics in mathematical statistics, theory of experiment design, numerical analysis, theoretical physics and chemistry, logical design and programming of computers and computer systems. Short numerical tables. Issued quarterly. Annual subscription: Domestic, $9.00; Foreign, $11.25.

DIMENSIONS/NBS (formerly Technical News Bulletin)—This monthly magazine is published to inform scientists, engineers, businessmen, industry, teachers, students, and consumers of the latest advances in science and technology, with primary emphasis on the work at NBS. The magazine highlights and reviews such issues as energy research, fire protection, building technology, metric conversion, pollution abatement, health and safety, and consumer product performance. In addition, it reports the results of Bureau programs in measurement standards and techniques, properties of matter and materials, engineering standards and services, instrumentation, and automatic data processing.

Annual subscription: Domestic, $6.45; Foreign, $7.85.

NONPERIODICALS

Monographs—Major contributions to the technical literature on various subjects related to the Bureau’s scientific and technical activities.

Handbooks—Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications—Include proceedings of conferences sponsored by NBS, NBS annual reports, and other special publications appropriate to this grouping such as wall charts, pocket cards, and bibliographies.

Applied Mathematics Series—Mathematical tables, manuals, and studies of special interest to physicists, engineers, chemists, biologists, mathematicians, computer programmers, and others engaged in scientific and technical work.

National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world’s literature and critically evaluated. Developed under a world-wide program coordinated by NBS. Program under authority of National Standard Data Act (Public Law 90-396).

NOTE: At present the principal publication outlet for these data is the Journal of Physical and Chemical Reference Data (JPORD) published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements available from ACS, 1155 Sixteenth St. N.W., Wash. D.C. 20036.

Building Science Series—Disseminates technical information developed at the Bureau on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

Technical Notes—Studies or reports which are complete in themselves but restrictive in their treatment of a subject. Analogous to monographs but not so comprehensive in scope or definitive in treatment of the subject area. Often serve as a vehicle for final reports of work performed at NBS under the sponsorship of other government agencies.

Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The purpose of the standards is to establish nationally recognized requirements for products, and to provide all concerned interests with a basis for common understanding of the characteristics of the products. NBS administers this program as a supplement to the activities of the private sector standardizing organizations.


Consumer Information Series—Practical information, based on NBS research and experience, covering areas of interest to the consumer. Easily understandable language and illustrations provide useful background knowledge for shopping in today’s technological marketplace.

NBS Interagency Reports (NBSIR)—A special series of interim or final reports on work performed by NBS for outside sponsors (both government and non-government). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Service (Springfield, Va. 22161) in paper copy or microfiche form.


BIBLIOGRAPHIC SUBSCRIPTION SERVICES

The following current-awareness and literature-survey bibliographies are issued periodically by the Bureau: Cryogenic Data Center Current Awareness Service

A literature survey issued weekly. Annual subscription: Domestic, $20.00; Foreign, $25.00.


Electromagnetic Metrology Current Awareness Service

Issued monthly. Annual subscription: $100.00 (Special rates for multi-subscriptions). Send subscription order and remittance to Electromagnetics Division, National Bureau of Standards, Boulder, Colo. 80302.