NATIONAL BUREAU OF STANDARDS REPORT

10 355

SUMMARY OF ACCOMPLISHMENTS IN BUILDING RESEARCH FISCAL YEAR 1970

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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NBS PROJECT		NBS REPORT
42100–4210900	October 1, 1970	10 355

SUMMARY OF ACCOMPLISHMENTS IN BUILDING RESEARCH FISCAL YEAR 1970

Building Research Division
Institute for Applied Technology
National Bureau of Standards

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

INTRODUCTION

The Bureau of the Budget has requested that the National Bureau of Standards/Building Research Division undertake additional activities to improve communications in building technology between Federal agencies.

The project summaries herein contained provide a brief account of the work that was done in the Building Research Division of the National Bureau of Standards during FY 1970.

Each summary contains a funding figure, a summary of output, and other particularized information including the name of the project leader. Comments, suggestions and inquires are welcomed (please contact the individual project leader). The summaries are arranged under the following Sections, Branches and Teams of the Building Research Division, each of which has the major responsibility for work in a particular area:

Structures
Fire Research
Materials Durability and Analysis
Building Systems
Scientific and Professional Liaison
State Codes and Standards
Sensory Environment
Environmental Engineering
Building Transport Systems
Applied Acoustics and Illumination
Operation BREAKTHROUGH Team

The distribution of this information is just one effort of the Building Research Division to improve communications between Federal agencies and to increase the dissemination of building research results.

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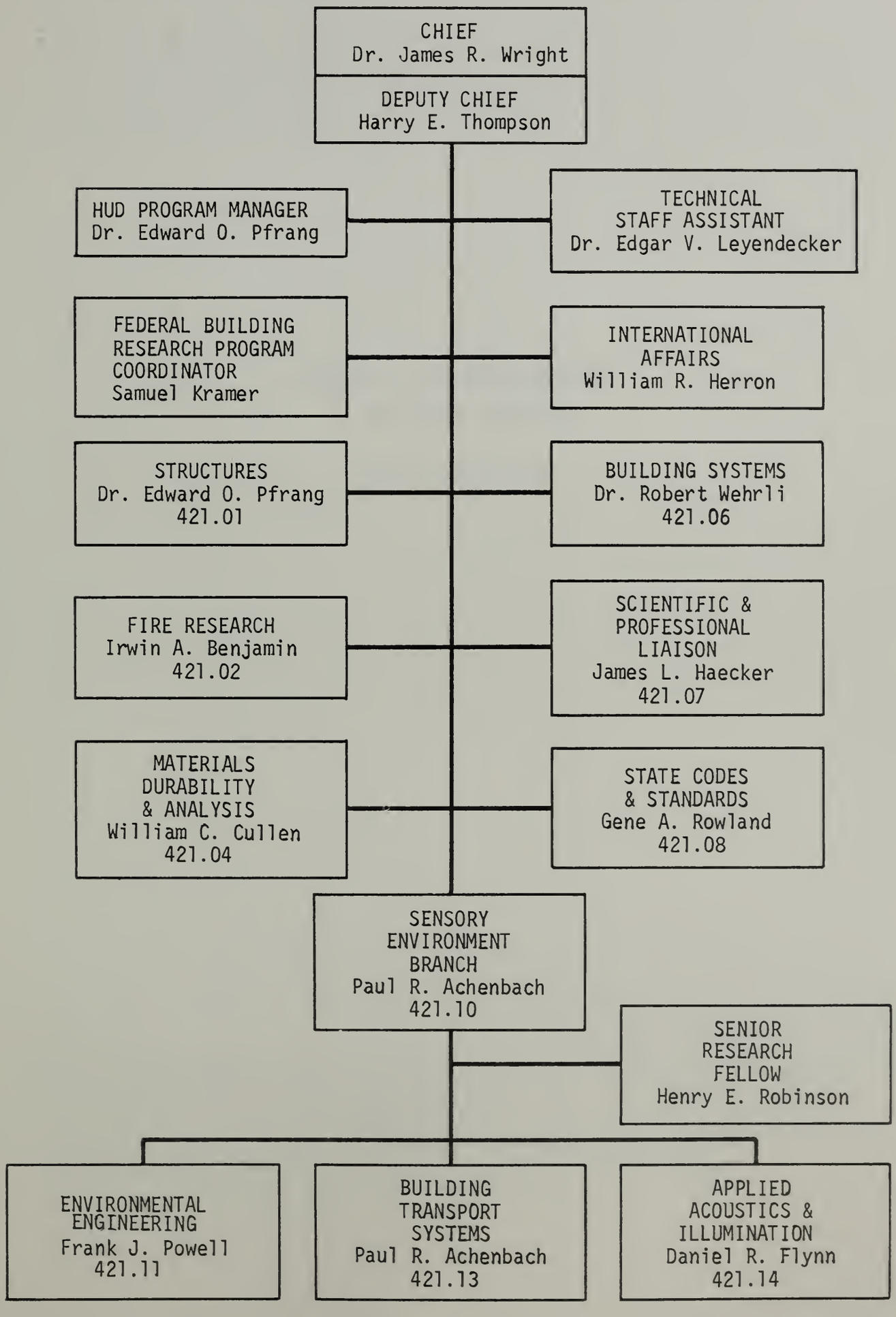
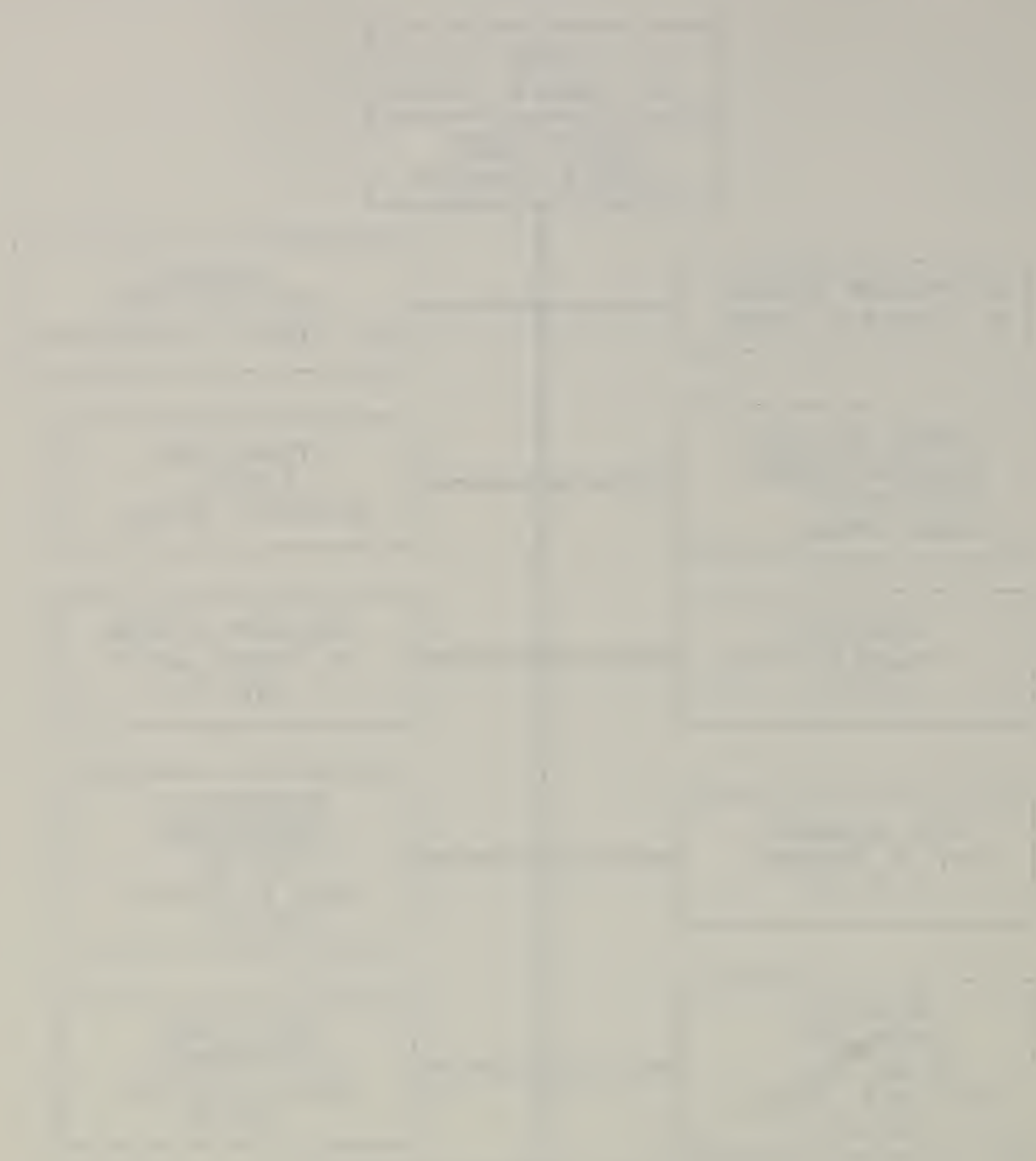
BUILDING RESEARCH DIVISION
INSTITUTE FOR APPLIED TECHNOLOGY
NATIONAL BUREAU OF STANDARDS





SUMMARY OF ACCOMPLISHMENTS
IN BUILDING RESEARCH

FISCAL YEAR 1970

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: International Building Research Cooperation

KEYWORD: International exchanges: U.S./USSR Building Technology Exchange; U.S./ French Building Technology Exchange

Project Number:
4213114

Project Leader:
W. R. Herron

Funding: RTS

BACKGROUND: Building Research and Building Technology is suffering from the problems common to the information explosion. Information and data from foreign countries can only become readily available through professional ties resulting from exchanges of professionals visiting each others laboratories for varying periods of time.

Project Initiation Date:
N/A

Completion Target Date:
Continuing project

RESEARCH EFFORT: The BRD through the Department of State and the U.S. Science Attache in Paris arranged and completed exchanges with the Soviet Union and France. In the first exchange our delegation of eight U.S. building experts visited the USSR from August 22 to September 9, 1969 and the Soviet delegation visited the U.S.A. during October 1 through 17, 1969. The second exchange with France included a visit by a team from BRD to the facilities of the Centre Scientifique et Technique du Batiment (CSTB) of France from November 19 to 29, 1969; and also a visit to BRD and various U.S. industries and centers of building technology from January 19 to 30, 1970.

Persons to contact for further information:

Mr. William R. Herron
Room B270, Building 226
Building Research Division
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3126

RESULTS: These exchanges gave the participants personal contact with counterparts in the country visited with a dialog lasting approximately two weeks in which instant feedback was possible for clarifying points. These exchanges were contrasting since the Soviet exchange was multi-disciplined and all parties participating together. The French exchange although multi-disciplined also was more intensive by dividing the teams for in-depth coverage with their hosts of the same background.

TECHNICAL CAPABILITIES Staff of personnel whose backgrounds cover all of the scientific and technical areas involved in Building Construction Technology and its research. Personal contact with academic community, other building research organizations, both public and private, standards promulgating organizations, and professional societies.

Notes: This work is fully described in the NBS Reports Nos. 10184, "Report of the U.S. Delegates to the Soviet Union", and 10237 "US/French Cooperative Program on Building Technology".

421.00

PROJECT TITLE: Masonry and Reinforced Concrete

KEYWORD: Reinforced concrete; masonry; structural properties

Project Number:
4212111

Project Leader:
Dr. E. O. Pfrang

Funding: $38 K

BACKGROUND: Data on properties of reinforced concrete and masonry are needed to establish satisfactory performance criteria and code requirements for various service conditions and for effecting economies.

Project Initiation Date:
March 1970

Completion Target Date:
This is a long term project with yearly outputs

RESEARCH EFFORT: Studies of such properties of structural systems as strength of bond between reinforcing bars and concrete, shear strength of reinforced concrete members, control of drying shrinkage, creep and shrinkage characteristics of structural lightweight concrete and transverse and racking strength of masonry were combined into a single project on January 1, 1966.

Analysis of behavior of masonry structural systems has been carried out. This work parallels the programs described under projects 4215412 and 4215423.

Considerable work was carried out by staff members on ACI, ASCE, ASTM, ANSI, HRB and PCI Committees dealing with masonry and concrete.

Persons to contact for further information:

Dr. E. O. Pfrang
B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Results from this project are being incorporated into nationally accepted design criteria for building systems and are thus affecting design and construction economics.

A National Conference, Performance of Masonry Structures, was held at NBS in March 1970.

Notes:

TECHNICAL CAPABILITIES Staff expertise; full laboratory facilities

421.01

PROJECT TITLE: Composite Structural Systems

KEYWORD: Beams; composite construction; shear connection

Project Number:
4212115

Project Leader:
Dr. H. S. Lew

Funding: $46,000
(FY 1970)

BACKGROUND: No definite analytical procedure is available for the evaluation of the load-carrying capacity of composite beams having partial shear connection. A procedure estimating the ultimate strength of such beams is given in the 1969 AISC building specification. To date, no experimental verification has been made to verify the validity of the provision of the specification.

Project Initiation Date:
August 1968

Completion Target Date:

In Progress

RESEARCH EFFORT: To study the behavior of beams having partial shear connection, the test beams were deliberately designed so that failure would take place in the shear connection rather than in the slab or in the steel beam. Parallel with the experimental investigation, analytical studies were also carried out. Four beams were tested under incremental static load. Each test beam was made of a 4 in x 48 in slab and a W12x27 of A36 steel. The amount and the longitudinal spacing of the connectors were varied for each specimen. Computer analysis was made for each beam to predict the strength and the deformation of these beams.

Persons to contact for further information:

Dr. H. S. Lew
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3475

RESULTS: The results of this study are being analyzed and when completed, appropriate design recommendations will be submitted to the AISC Specification Committee.

Notes:

TECHNICAL CAPABILITIES Tie-down dynamic test bed (40X70 ft) Hyraulic rams of 10 ton capacity Automatic Data Acquisition systems controlled by digital computer.

421.01

PROJECT TITLE: Safe Loads on Structures

KEYWORD: Flood loads; fire loads; design load

Project Number:
4212116

Project Leader:
J. O. Bryson

Funding: $2.8 K

BACKGROUND: Design loads now specified in codes and standards have evolved over the years through information from very limited studies. It is now feasible with the tools of modern technology to determine with measured accuracy, the characteristic of actual loadings on buildings.

Project Initiation Date:
July 1969

Completion Target Date:
Indefinite

RESEARCH EFFORT: The initial phase of this project was devoted to the development of survey techniques and procedures through a pilot study of two government owned buildings. This work is described in the NBS Publication, BSS 16. The present phase of the work is concerned with the development of more advanced survey techniques leading to complete reliance on statistical sampling and load estimation. An extensive recruiting effort is underway to locate an engineer with the special talents needed to carry out a successful program

Persons to contact for further information:

J. O. Bryson
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

RESULTS: The foundation has been established for conducting a broad study of live floor loads and fire loads in buildings across the country. Plans are in the development stage for the next phase of the work.

Notes:

TECHNICAL CAPABILITIES Development of survey procedures and evaluation techniques for studies of floor loads on buildings. Use of statistical sampling technique and automatic data processing for generating a large data bank of comprehensive information on floor loads.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Connections in Prefabricated Structures

KEYWORD: Reinforced Concrete; post-tensioned concrete; beam-column connections; precast concrete

Project Number:
4212117

Project Leader:
Dr. E. V. Leyendecker

Funding: $47.7 K

BACKGROUND: The use of precast concrete has increased rapidly during the last twenty years. As its use increases connections, particularly beam-column connections, are becoming an area in need of research.

Project Initiation Date:
FY 1967

Completion Target Date:
Continuing project

RESEARCH EFFORT: The project consisted of continuous beam-column connections fabricated in precast reinforced concrete and precast post-tensioned concrete. Five types of connections (including monolithic construction) were tested in the reinforced phase and four types of connections (including monolithic construction were tested in the post-tensioned phase. Each connection was studied under two loading cases (one specimen per loading): (1) beams subjected to vertical load only and (2) beams subjected to vertical load and axial tension load.

Persons to contact for further information:

Dr. E. V. Leyendecker
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3475

RESULTS: Six precast reinforced concrete connections (for a total of nineteen in the testing program) and eight precast post-tensioned connections were tested during FY 1970. These tests completed the laboratory portion of the investigation. Data analysis and reports are in progress.

Notes:

TECHNICAL CAPABILITIES (1) Versatile loading equipment which permits static testing of full-size beam-to-column connections subjected to various combinations of loading.

(2) Computer controlled data acquisition system.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Post Office Department

KEYWORD: Inserts, drilled-in

Project Number:
4213417

Project Leader:
T. W. Reichard

Funding: $13,000

BACKGROUND: The Post Office Department specifies the use of these drilled-in inserts (anchors), but with little confidence in their load-carrying ability under tensile pull-out loads. Multiple inserts are specified in some cases so as to distribute loads.

Project Initiation Date:
August 1969

Completion Target Date:
April 1970

RESEARCH EFFORT: The prime objective was to determine load capacities of some typical 3/4 in. inserts when installed in reinforced concrete slabs. The variables studied included: spacing between inserts, type of concrete, depth and diameter of drilled hole and cycle loading.

Persons to contact for further information:

T. W. Reichard
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

E. V. Leyendecker
Same address as above.

RESULTS: The data indicate that the performance of the three types of inserts are comparable. The effect of the variables on individual insert capacity was similar to that found for the cast-in-place inserts. In multiple installations the load capacity of n inserts is n times individual capacity when spacing is 18 in. or greater.

Notes: See NBS Technical Report No. 10192, "Pull-Out Strength of Closely Spaced Drilled-In-Inserts in Concrete."

TECHNICAL CAPABILITIES: Designed and built a hydraulic test apparatus suitable for the simultaneous tensile loading of multiple devices spaced from 6 in. to about 60 in.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Structural Models

KEYWORD: Models; masonry; walls

Project Number:
4215112

Project Leader:
Dr. E. V. Leyendecker

Funding: $10.9 K

BACKGROUND: A project was initiated to develop masonry modeling techniques and evaluate the reliability of modeling masonry walls. The use of scale models can be used to complement and extend the range of data obtained from tests on full-size masonry walls.

Project Initiation Date:
July 1, 1969

Completion Target Date:

June 30, 1971

RESEARCH EFFORT: Twenty thousand, one-quarter scale models of 8 x 8 x 16 hollow concrete masonry blocks ordered from the National Concrete Masonry Association. Three types of blocks were obtained: (1) stretcher units, (2) double corner units, and (3) half units.

Persons to contact for further information:

Dr. E. V. Leyendecker
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3475

RESULTS: The contract for the blocks was completed during FY1970.

Notes:

TECHNICAL CAPABILITIES (1) Materials and equipment for fabrications of one-quarter scale concrete block masonry walls.

(2) Computer controlled data acquisition system.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Wind Loads on Structures

KEYWORD: Wind loads

Project Number:
4215113

Project Leader:
R. D. Marshall

Funding: $42,260.00

BACKGROUND: Project was initiated on 7-1-68 as pilot project for research into the effects of wind on buildings.

Project Initiation Date:
July 1968

Completion Target Date:
N/A

RESEARCH EFFORT: An array of meteorological towers was established to the north of Bldg, 226 and several fast-response anemometers were installed. Pressure transducers were installed in the north and south faces of Bldg. 226 and simultaneous pressure-velocity records were obtained. Work was continued on methods of data reduction and analysis.

Persons to contact for further information:

R. D. Marshall
B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Techniques for the measurement of both steady and fluctuating pressures over the exterior walls of buildings and the structure of the oncoming wind were developed.

Notes:

TECHNICAL CAPABILITIES Included anemometers, pressure transducers and analog recording of wind, pressure and time signals.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Evaluation of Occupied Buildings

KEYWORD: Floor loads; fire loads; design loads

Project Number:
4215361

Project Leader:
J. O. Bryson

Funding: $20 K

BACKGROUND: A grant to NBS of $20,000 was made by the American Iron and Steel Institute to aid in the continuation of the study of occupancy loads in buildings. Planning on the continuation of the study, featuring surveys of several buildings to add to the bank of data already accumulated, will commence shortly after the first of the FY71.

Project Initiation Date:
June 1969

Completion Target Date:
Indefinite

RESEARCH EFFORT: See description for Project No. 4212116

Persons to contact for further information:

J. O. Bryson
B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: See description for Project No. 4212116

Notes:

TECHNICAL CAPABILITIES Development of survey procedures and evaluation techniques for studies of floor loads on buildings. Use of statistical sampling technique and automatic data processing for generating a large data bank of comprehensive information on floor loads.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Dow

KEYWORD: Masonry; mortar

BACKGROUND: Objectives were to develop experimental data and rational design criteria for masonry walls built with high-strength mortars.

RESEARCH EFFORT: Experimental program was conducted on two wall systems: (1) 6 in. ground concrete block and epoxy adhesive mortar and (2) 4 in. brick with an organic-modified mortar. Approximately 60 small specimens and 24 full scale walls were tested with various combinations of transverse and compressive loads.

RESULTS: Experimental program was completed in FY 70. Analysis of data will be in accordance with procedures recommended in NBS Report 10139 (December 1969).

TECHNICAL CAPABILITIES : 600,000 lb. capacity compression testing machine; ASTM E72 transverse load equipment; automatic electronic multichannel data logging system.

Project Number:
4215362

Project Leader:
R. D. Dikkers

Funding: $5.0 K
(Dow Chemical)

Project Initiation Date:
February 1970

Completion Target Date:
February 1971

Persons to contact for further information:
Robert D. Dikkers
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

Notes: Test data and analysis are to be published in a NBS report scheduled for completion by February 1971.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Racking Strength of Walls

KEYWORD: Masonry walls; racking; shear

Project Number:
4215412

Project Leader:
R. D. Dikkers

Funding: $25.0 K - FY70
(Tri-Services)

BACKGROUND: One of the principal structural functions of masonry walls is to resist the effects of racking loads (horizontal loads in the plane of the wall). There is a need for improved racking test methods and design criteria.

Project Initiation Date:
FY 1968

Completion Target Date:
January, 1971

RESEARCH EFFORT: During FY 1968 and 1969, 80 masonry walls were tested. Walls were constructed with (a) brick and high bond mortar; (b) brick and regular mortar; and (c) concrete block and regular mortar. In some tests walls were subjected to a combination of vertical compressive loads and racking loads.

Persons to contact for further information:

Mr. Robert Dikkers
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

RESULTS: Analysis of test data obtained to date has led to the following conclusions: 1) Traditional test method (ASTM E72) does not provide sufficient information and 2)racking strength of walls increases where compressive vertical loads are applied.

Notes: Test data and analysis are to be published in a NBS report scheduled for completion by January 1971.

TECHNICAL CAPABILITIES : Laboratory can accommodate full scale tests of multistory walls. Instrumentation includes automatic electronic multi-channel data logging system.

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Study of Occupancy Loads in Postal Facilities

KEYWORD: Live loads; conveyor loads; mail load

BACKGROUND: The POD is directing a very strong effert toward upgrading the mail handling activities with the tools of available technology which, at present, are not being used. Present data is inadequate for design of post office structures for the expected loading over the useful life of the building.

RESEARCH EFFORT: A program was initiated at the beginning of FY69 to study the existing loads in a sample of postal mail handling facilities across the nation. The main objective is to investigate the magnitudes and distributions of actual occupancy loads imposed on the structures for the purpose of making engineering recommendations for values of loads to be used in the design of new facilities.

RESULTS: The work is now in the final stages of the program. A total of seven "major mail handling facilities" have been surveyed for occupancy loads associated with mail handling activities. All of the data collected in the surveys are being evaluated with several computer programs designed to provide characteristic information on post office facility loadings associated with work activities and the floor area divisions. Two interim reports have been prepared for the sponsor.

TECHNICAL CAPABILITIES Development of survey procedures and evaluation techniques for studies of floor loads on buildings. Use of statistical sampling technique and automatic data processing for generating a large data bank of comprehensive information on floor loads.

Project Number:
4215418

Project Leader:
J. O. Bryson

Funding: $126 K
(FY 70)

Project Initiation Date:
August 1968

Completion Target Date:
March 1971

Persons to contact for further information:

J. O. Bryson
B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes:

421.01

PROJECT TITLE: Structural Evaluation (Navy) Phase II

KEYWORD: Building systems; performance

Project Number:
4215421

Project Leader:
T. W. Reichard

Funding: $38.5 K

BACKGROUND: The Navy Department is considering the prefabricated "Lewis" building as a replacement for the Quonset as an airliftable, relocatable structure.

Project Initiation Date:
July 1969

Completion Target Date:
July 1970

RESEARCH EFFORT: Evaluate the Mark IIIA design for the Lewis Building as to its performance when made longer than the 48 ft. length. In addition, the load carrying capacities of various components used at critical locations were determined.

Persons to contact for further information:

T. W. Reichard and
E. V. Leyendecker
National Bureau of Standards
Room B168, Building 226
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

RESULTS: The performance of this building under winds of 60 mph or greater would be questionable if constructed without end walls.

Notes: Report has been prepared and sent to the Navy for comments.

TECHNICAL CAPABILITIES: Designed and built a set of adjustable loading frames suitable for application of transverse loads (simulating wind pressure) to buildings erected in the structural test laboratory

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Transverse Strength of Walls

KEYWORD: Masonry; slenderness effects; transverse strength

BACKGROUND: Objectives of this program were to develop experimental data and rational design criteria for various masonry wall systems subjected to transverse and/or vertical compressive loads.

RESEARCH EFFORT: Experimental program included about 130 masonry walls which were tested in FY 67 and 68. Ten different wall systems were tested with two types of loading: (1) a combination of transverse loads normal to the plane of walls and vertical compressive loads, and (2) transverse loads normal to plane of wall with mortar bed joints parallel to the direction of bending.

RESULTS: On basis of experimental data from first type of loading, a new analytical approach was developed by which the effects of vertical load and wall slenderness on transverse strength can be evaluated.

TECHNICAL CAPABILITIES: 600,000 lb. capacity compression testing machine; ASTM E72 transverse load equipment; automatic electronic multichannel data logging system.

Project Number:
4215423

Project Leader:
R. D. Dikkers

Funding: $10.0 K - FY 70
(Tri-Services)

Project Initiation Date:
FY 1967

Completion Target Date:
June 1970

Persons to contact for further information:

Mr. Robert D. Dikkers
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

Notes: Main portion of research program is described in NBS Report 10139 by F. Y. Yokel, R. G. Mathey, and R. D. Dikkers (December 30, 1969).

421.01

PROJECT TITLE: Paper Honeycomb Sandwich Panels (Army)

KEYWORD: Sandwich panels; paper honeycomb

Project Number:
4215424

Project Leader:
T. W. Reichard

Funding: $7.0 K

BACKGROUND: The military has a need for a procurement specification which will insure the receipt of satisfactory sandwich panels for use in advanced-base, airliftable structures.

Project Initiation Date:
July 1969

Completion Target Date:
September 1970 - Phase I

RESEARCH EFFORT: Under the terms of a contract with the Army Natick Labs, NBS is determining typical properties of the available paper honeycombs and facing materials suitable for use in high quality structural panels. At the same time the suitability of standard test methods for determining these properties are being studied. A secondary objective is the development of process controls for lamination of sandwich panels.

Persons to contact for further information:

T. W. Reichard
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
921-3475

RESULTS: It has been determined that there is a wide variability in the properties of paper honeycombs purchased from 4 manufacturers under the same specifications.

Notes: A progress report NBS Report No. 10255 was forwarded to Natick. This covered the results of a short study of a particular example of poor panel procurement.

TECHNICAL CAPABILITIES: In-house capability and techniques for laminating high quality sandwich panel samples was developed.

421.01

PROJECT TITLE: Energy Absorbing Structural Joints (Army)

KEYWORD: Joints; connections; earthquakes; steels; reinforced concrete; precast concrete; prestressed concrete

BACKGROUND: Under the sponsorship of the Corps of Engineers and the NBS, a survey of literature in the area of energy absorbing structural joints and connections was conducted. The purpose of this survey was to establish the present state-of-the-art.

RESEARCH EFFORT: The survey was conducted through three separate channels. Firstly, the survey was made using the retrieval system at the Clearinghouse, the Defense Documentation Center and the Smithsonian Institution. Secondly, the published articles were surveyed in the Engineering Index, the Mechanics Review and other indexes, such as the ones published by the NASA and Japanese journals. Thirdly, letter inquiries were made to collect the information on researches in progress. All collected materials were reviewed and pertinent abstracts were extracted.

RESULTS: The material collected through the survey would serve immediately as a reference source to structural engineers, providing urgently needed useful information for immediate application. It would provide researchers with summaries of previous work. It would also serve as a guide to research planners and sponsors in developing new research programs.

TECHNICAL CAPABILITIES Laboratory facilities not related to this project.

Project Number:
4215425

Project Leader:
H. S. Lew

Funding: $19,100

Project Initiation Date:
July 31, 1969

Completion Target Date:
June 30, 1970

Persons to contact for further information:

Dr. H. S. Lew
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3475

Notes:

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Wind Loads on Structures

KEYWORD: Wind loads

Project Number:
4215426

Project Leader:
R. D. Marshall

Funding: $2,000.00

BACKGROUND: For safety and economy of construction, accurate knowledge of the magnitude of wind loads and their probability of occurence is extremely important. The documentation of wind effects on full-scale buildings is necessary to achieve this goal.

Project Initiation Date:
October 1969

Completion Target Date:
July 1970

RESEARCH EFFORT: The initial phase of this project consisted of data acquisition and the development of computer programs to give statistical information of the mechanism by which velocity fluctuations are converted into pressure pulsations on a structure.

Persons to contact for further information:

R. D. Marshall
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Several pressure and velocity records were obtained during strong-wind conditions. No analysis of these data has been completed.

Notes:

TECHNICAL CAPABILITIES Include instrumentation for recording wind speed and pressure on full-scale structures.

421.01

PROJECT TITLE: An Appraisal of Hurricane Camille--Wind Intensity and Structural Damage

KEYWORD: Hurricane Camille

BACKGROUND: An assessment of available meteorological records and observed structural damage after the passage of Hurricane Camille allows existing code provisions for wind loads to be evaluated.

RESEARCH EFFORT: Considerable information has been collected on structural damage and new estimates of wind speed and surge heights have been made. Damage distribution has been correlated with isotachs of fastest-mile wind speeds.

RESULTS: A final report is in preparation.

TECHNICAL CAPABILITIES : Includes analysis of wind and surge data.

Project Number:
4215427

Project Leader:
R. D. Marshall

Funding:
$2,000.00

Project Initiation Date:
January 1970

Completion Target Date:
June 1970

Persons to contact for further information:
R. D. Marshall
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes:

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Wind Loads on Structures

KEYWORD: Wind loads

Project Number:
4215428

Project Leader:
R. D. Marshall

Funding:
$10,000.00

BACKGROUND: Documentation of the behavior of full-scale buildings subjected to surface winds is required to establish improved design criteria and techniques.

Project Initiation Date:
March 1970

Completion Target Date:
June 1970

RESEARCH EFFORT: Analog recordings of turbulence in the oncoming wind and simultaneous records of pressure fluctuations on Bldg. 226 were obtained. An attempt is being made to correlate the two sets of records.

Persons to contact for further information:

R. D. Marshall
Room B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: A statistical analysis of the wind and pressure records is in progress.

Notes:

TECHNICAL CAPABILITIES: Include anemometers, pressure transducers, analog recorders and analog to digital conversion and analysis.

421.01

PROJECT TITLE: Wind Loads on Structures

KEYWORD: Wind loads

BACKGROUND: Improved design criteria and techniques require a better understanding of wind effects on full-scale buildings.

RESEARCH EFFORT: Mean velocity profiles and the turbulent structure of the oncoming wind were obtained for a number of directions under strong-wind conditions. Records of bath steady and fluctuating pressures were obtained for Building 226.

RESULTS: Computer analysis of records is now in progress.

TECHNICAL CAPABILITIES Includes instrumentation for recording wind speed and pressure on full-scale structures.

Project Number:
4215429

Project Leader:
R. D. Marshall

Funding: $3,000.00

Project Initiation Date:
March 1970

Completion Target Date:
June 1970

Persons to contact for further information:

R. D. Marshall
B168, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes:

421.01

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Field Fire Tests

KEYWORD: Mobile facilities; planned fires

Project Number:
4212229

Project Leader:
D. Gross
J. S. Steel

Funding: $75 K

BACKGROUND: This project covers work done on fire studies outside of Gaithersburg and is generally devoted to work on the initiation and spread of fire.

Project Initiation Date:
FY 1970

Completion Target Date:

Continuing Project

RESEARCH EFFORT: A mobile data gathering facility was under construction. This van was used for a study of fire detection systems conducted by the USCG. Work was conducted on an international research program sponsored by CIB on the growth of fire in models. A new facility was designed to measure fire and smoke growth in a room under controlled ventilation. A facility to study spread of fire in corridors was also designed.

Persons to contact for further information:

D. Gross
B66, Technology
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Data was compiled on the CIB model tests and exchanged at the last CIB meeting in Europe. The test van was made operational during the year. The smoke and fire growth facility was built.

Notes:

TECHNICAL CAPABILITIES

1. Mobile Data Facility - 300 points of information
2. Smoke & Fire Growth Facility - complete
3. Full Scale 30 Ft. Long Corridor Facility - under construction.

421.02

PROJECT TITLE: Fire Endurance

Project Number:
4215122

Project Leader:
W. J. Parker

KEYWORD: Fire testing; test methods

Funding: $56 K

BACKGROUND: Project is devoted to the development and refinement of test procedures.

Project Initiation Date:
FY 1970

Completion Target Date:

Continuing project

RESEARCH EFFORT: A new design of test apparatus for studying fire spread was built and used in conjunction with an ISO research program to develop a new fire spread test. A prototype piece of apparatus was built to study the rate of release of heat from building materials and constructions. Study was conducted to improve the IMCO test methods for noncombustibility. Wall tests were conducted to study the effect of various types of thermocouples on wall fire endurance.

Persons to contact for further information:

D. Gross
B66 Technology
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Report made to ISO working group on results of test development. Initial studies on the rate of heat release equipment were reported. Data on the IMCO test improvement was submitted to ISO committee. Work on wall performance is still in progress.

Notes:

TECHNICAL CAPABILITIES Several new test procedures and new equipment for testing are under development.

421.02

PROJECT TITLE: Analysis of Combustion Products

KEYWORD: Combustion products; flame inhibition

Project Number:
4216223

Project Leader:
Dr. J. J. Comeford

Funding: $57 K

BACKGROUND: Very little basic information is presently available on the mechanism of smoke formation, flame inhibition by halogenated inhibitors, and role of inhibitors in polymer pyrolysis. A correlation of polymer structure and additives with pyrolysis products and smoke formation could lead to methods of reducing smoke and fire hazards.

Project Initiation Date:
FY 70

Completion Target Date:

Continuing project

RESEARCH EFFORT: Experimental studies are underway to identify the important chemical reactions and chemical species during the pyrolysis of various polymeric materials. Very low temperature isolation at 20 Kelvin or less will be used in conjunction with infrared spectroscopy to stabilize reactive products such as free radicals and identify them.

Persons to contact for further information:

Dr. J. J. Comeford
Room A63, Tech. Building
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: A low temperature cryostat and high vacuum system have been assembled and tested. A high energy molecular gas laser has been obtained for flash pyrolysis studies. The spectral distribution of radiation from various diffusion flames has been measured.

Notes: Papers in process

TECHNICAL CAPABILITIES Infrared and ultraviolet spectrometers; cryogenic equipment and high vacuum systems.

421.02

PROJECT TITLE: Reference Material for Water-Vapor Permeance

KEYWORD: Reference material; water-vapor permeance

Project Number:
4211757

Project Leader:
William C. Cullen

Funding: $2.0 K

BACKGROUND: The use of water and vapor barriers in building construction, e.g., roofing, cladding systems, has been increasing. Methods have been developed for measuring the water vapor permeance of building materials, e.g., ASTM Methods E 96 and C 355. A need existed for a reference material for the calibration of apparatus and methods of test for measuring water-vapor permeance.

RESEARCH EFFORT: A reference material for water-vapor permeance was systematically developed through the cooperation of ASTM Committee C-16. Round robin tests among six participating laboratories were conducted. Water-vapor permeance tests were performed and a material was selected for distribution as a water-vapor reference material.

Project Initiation Date:
September 1966

Completion Target Date:
N/A

Persons to contact for further information:

Mr. William C. Cullen, Chief
Materials Durability and
Analysis Section
B-348, Building Research
National Bureau of Standards
Washington, D. C. 20234

RESULTS: Specimens of "Mylar" plastic film, .001 in thickness, were selected as the reference material. The permeance of the reference materials ranges from 0.65 to 0.75 perms (grain per square foot per hour per inch of mercury vapor pressure differential). Specimens will be prepared for those requesting these materials.

Notes: NBS Reference Standard 707

TECHNICAL CAPABILITIES Personnel and laboratory facilities for measuring water-vapor permeance of building materials.

421.04

PROJECT TITLE: Simulated External Environmental Changes of Roof Assemblies

KEYWORD: Built-up roofing; design criteria; performance

BACKGROUND: The project is designed to help alleviate, through research and information exchange, the high maintenance repair and replacement cost of roofing. Major contributions are made to and from other related technical programs; see project numbers 4216201, 4212447 and 4216364.

RESEARCH EFFORT: The basic understanding of the causes of premature failure, such as thermal movement, moisture migration and roof slippage under this project has led to design criteria for built-up roofing.

RESULTS: Federal, state and local governments as well as the private sector were recipients of technical services provided under this project. A prototype guide specification for built-up roofing was also part of the contribution of this effort. It includes new and exacting performance-type requirements for ensuring the integrity of the entire roofing system.

TECHNICAL CAPABILITIES Laboratory equipment for physical, thermal, and chemical properties of component parts and complete membrane roofing systems. In addition, laboratory equipment for simulated weathering and outdoor exposure sites at eight different climatic areas.

Project Number:
4212247

Project Leader:

Thomas H. Boone

Funding: $40.0 K

Project Initiation Date:
January 1966

Completion Target Date:

June 1972

Persons to contact for further information:

Thomas H. Boone
Room B348, Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3371

Notes: N/A

421.04

PROJECT TITLE: Atmospheric Corrosion of Metallic Composites

KEYWORD: Atmospheric corrosion; metallic composites

Project Number:
4212270

Project Leader:
Joseph W. Pitts

Funding: $35.0 K RTS

BACKGROUND: Atmospheric corrosion of the commonly-used metals in buildings is an unsolved problem. With the increased corrosiveness of urban atmospheres caused by air pollution, it becomes ever more important to learn as much as possible about the mechanisms responsible for atmospheric corrosion and the effects of natural weathering phenomena intensified by active contaminants.

RESEARCH EFFORT: An environmental test chamber and associated apparatus was designed for studying the corrosion of metals and metallic composites in atmospheres containing varied and controlled amounts of contaminants. The apparatus has the unique capability of rapid cycling between dew formation and evaporation. Concurrent with the laboratory experiments, specimens of metallic-coated steels have been placed on exposure at seven NBS outdoor weathering test sites.

Project Initiation Date:
January 1, 1966

Completion Target Date:
June 30, 1972

Persons to contact for further information:

William C. Cullen, Chief
Materials Durability and
Analysis Section
B-348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Experiments have shown the effect on the corrosion rate of steel that resulted from varying the concentration of sulfur dioxide in the atmosphere. Further experiments with metallic-coated steels (aluminumized and galvanized) confirmed the superior performance of the aluminum-coated steels.

Notes: This research is fully described in Materials Research & Standards, Vol. 6, No. 7, pp. 328 to 333, July 1966; and NBS Report No. 9937, October 1968.

TECHNICAL CAPABILITIES Environmental chamber equipped with thermoelectric cooling device; outdoor exposure test sites.

421.04

PROJECT TITLE: Test Methods for Coating Systems

KEYWORD: Organic coatings; test methods; performance

Project Number:
4212272

Project Leader:
Paul G. Campbell, Ph. D.

Funding: $50 K

BACKGROUND: There is a continuing need to develop analytical test methods for the measurement of performance of coating systems. Test method development also provides us with a means of cooperating with ASTM Committee D-1 and its importance is evidenced by the fact that this work is also supported by the tri-service paint project. Improvements in test methods result in improved specifications for organic coatings.

Project Initiation Date:
January 1966

Completion Target Date:
January 1972

RESEARCH EFFORT: An IR method for resin analysis of several resins used in organic coatings was investigated. The coatings included both solvent and latex types. Physical test methods studied for use in specification development have included storage stability tests, abrasion resistance, water resistance, and vapor permeability. Cooperative studies with ASTM Committee D-1 relating to test method development were continued. These studies included accelerated weathering, soil removal and brushability.

Persons to contact for further information:

Paul G. Campbell, Ph. D.
Room B348, Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3441

RESULTS: The analytical technique for resin analysis has been applied to a publication and is being applied to modify the specification requirements of a filler coating. Modifications to a wind driven rain test apparatus have been applied to a specification for textured coatings.

Notes: The analytical methods developed by this research is described in the paper "The Determination of Styrene-Butadiene and Styrene-Acrylate Resins in Solvent Type Paint".

TECHNICAL CAPABILITIES A complete coating, testing laboratory, capable of developing physical and chemical test methods pertinent to the examination of organic coatings.

421.04

PROJECT TITLE: Field Laboratory Investigation of Floor Assemblies

KEYWORD: Carpet; floor coverings; foot comfort; performance requirements; resilient types; slip resistance; test methods; textile types; vehicle movement; water resistance; wear resistance

Project Number:
4212273

Project Leader:
Winthrop C. Wolfe

Funding: RTS $23 K

BACKGROUND: Floor coverings are the surface of the floor assembly on which all activities of the building take place. ASTM and ANSI recognize the urgent need for performance or consumer standards for floor coverings. In addition to performance test development this project includes consultative and advisory service to government agencies, manufacturers and consumers.

Project Initiation Date:
January 1966

Completion Target Date:
January 1972

RESEARCH EFFORT: Performance tests were developed for resilience as related to foot comfort and for resistance to movement of wheeled vehicles. Research is continuing on tests for wear, slip resistance, water resistance. Approach is to correlate field observations and laboratory tests and to use well-known floor coverings as standards to develop performance tests.

Persons to contact for further information:

Mr. Winthrop C. Wolfe
Room B348, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Performance tests have been proposed for resilience and resistance to movement of wheeled vehicles. Fed. Spec. LLL-F-1238 was revised and changes recommended for Proposed Fed. Spec. SS-T-312A for asphalt, rubber, vinyl, and vinyl asbestos tile. Consultative assistance was provided in preparing the Guide Specs. and in evaluating proposals for OPERATION BREAKTHROUGH. ASTM Committee F-6 was established and the scope was enlarged to include performance standards. Subcommittee F-6.50 was established to cover consumer standards.

TECHNICAL CAPABILITIES Load-strain testing machine, special equipment for testing resilience, indentation, water resistance, carpet thickness gauge.

Notes: This research is described in ASTM Matls. and Stds., July, 1970, p. 15; CSI Monograph 9M1, AUG., 1966; NBS Tech. News STR 3841, 4076; NBS Reports 7492, 8009, 8536, 9531, 9895.

421.04

PROJECT TITLE: Measurement of Environmental Elements

KEYWORD: Building materials; durability

BACKGROUND: Acceleration of the aging process of materials is one means for determining their service life. Accurate characterization of the test conditions is essential. Ultraviolet light dosage is very important.

RESEARCH EFFORT: Three generations of a device for sensing and integrating ultraviolet light intensity for a period of one month have been assembled and tested. Critical components and circuitry were tested simultaneously for service life and sensitivity to environmental changes. Several devices have been tested after each month of service at one of the outdoor exposure sites since March of this year.

RESULTS: Recalibration of devices after one month service has revealed a departure from the original calibration of less than five percent for the worst case. This can be improved by preaging the batteries.

TECHNICAL CAPABILITIES A device is available for the first time which can measure the total of the ultraviolet energy to which materials are exposed during tests in the laboratory or outdoors.

Project Number:
4212279

Project Leader:
Warren D. Hayes, Jr.

Funding: $43.0 K

Project Initiation Date:
January 1966

Completion Target Date:
June 1970

Persons to contact for further information:

Mr. Warren D. Hayes, Jr.
Room B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes: N/A

421.04

PROJECT TITLE: Building Joint Sealants

KEYWORD: Joints; building joints; sealants; calking compounds; sealing compounds; leakage; waterproofing; glazing

Project Number:
4212413

Project Leader:
A. Hockman

Funding: $25,000.00

BACKGROUND: Present building design and practice has created a situation where water and air leakage through building joints have become commonplace. Leakage through joints damages walls, floors and reduces efficiency of heating and cooling systems. Architects and others close to the problem recognize the urgent need for improved sealant quality, joint design, specifications and application methods.

RESEARCH EFFORT: Performance criteria are developed for all types of liquid joint sealants and for improved joint design. Criteria are for single family dwellings, high-rise apartments, office buildings, plazas, decks, and related joint areas where water leakage must be stopped. Standard performance tests include rheological properties, application life, extrusion rate, stain, hardening properties, effects of heat aging, water immersion, extension compression cycles, peel strength, and effects of UV radiation on sealant performance life. New formulations are received continuously from producers to help guide improved standards development.

RESULTS: Fed. Spec. TT-S-00230C (one-part sealants) and TT-S-00227E (multi-part sealants) were updated and published. Fed. Spec. TT-C-598B (oil and resin base calking) was updated and is in process for publication. Proposed spec. for butyl compounds was drafted. Round Robin study proved accelerated sealant curing was acceptable. Proposed draft of new test to predict cracking by UV was completed. A first list of qualified sealants was given to the sponsors.

TECHNICAL CAPABILITIES Load-strain testing machine, automatic extension-compression machines, temperature-humidity ovens, joint sealants simulator weathering machine and others.

Project Initiation Date:
July 1963

Completion Target Date:
June 1972

Persons to contact for further information:

A. Hockman
B348, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes: Federal Specifications on building joint sealants are available from the General Services Administration or Superintendent of Documents.

421.04

PROJECT TITLE: Characteristics of Protective Coating Systems

KEYWORD: Organic coatings; performance; specifications

Project Number:
4212441

Project Leader:
Paul G. Campbell, Ph. D.

Funding: $51.0 K

BACKGROUND: The Army, Navy and Air Force desired to establish a Paint Committee including an NBS representative, which could investigate coating problems common to all. The project included the investigation to determine the performance and other characteristics of new organic coatings, to prepare specifications, to assist in the preparation of a coatings manual, and to provide consultative and advisory services.

RESEARCH EFFORT: Under contract with the three services, a coatings manual was prepared. Laboratory performance characteristics were studied of textured coatings, modified exterior latex paints, trim paint, and cementitious paint. The outdoor performance characteristics of house paints and silicone-alkyd coatings were also studied. Due to problems of quality control, selected paint samples were examined for compliance to specifications.

Project Initiation Date:
January 1966

Completion Target Date:

N/A

Persons to contact for further information:

Paul G. Campbell, Ph. D
Room B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3441

RESULTS: The utility of the coatings manual was evidenced by the request of FAA to adapt the manual for their use. Specifications for textured coatings and trim paint have been submitted to GSA. Consultative and advisory services have been furnished as requested, including inspection trips, workshop presentations, and assistance on other military guide specifications.

TECHNICAL CAPABILITIES A complete coatings laboratory, capable of examining the physical and chemical properties of organic coatings. As an accessory we have the Ft. Meade, Maryland housing test site, the NBS exposure test sites, and an accelerated weathering laboratory for performance testing.

Notes: This work is described in the paper "Determination on Styrene-Butadiene and Styrene-Acrylate Resins in Solvent Type Paint" published in the Journal of Paint Technology 41 567 (1969). Federal Specifications for paints are available from the General Services Administration.

421.04

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Performance of Roofing

KEYWORD: Urethane foam roofing; evaluation; advisory service

BACKGROUND: A performance evaluation of foam roofing systems is needed to provide consultative and advisory services to military installations that have problems with these new roofing systems.

RESEARCH EFFORT: Evaluations of the techniques and control of roof applications, types of protective top coating, technique for repair and maintenance, long term durability and performance in all climatic areas by field and laboratory investigations were made on the foam urethane roof systems.

RESULTS: Reports on the findings and recommended treatment, repair or replacement were submitted to the sponsors for solutions to roofing problems at the Naval Air Station, Lemoore, Calif.; Defense Personnel Support Center, Philadelphia, Pa., and Fort Bragg, N. C.

TECHNICAL CAPABILITIES Laboratory equipment for physical, thermal, and chemical properties of component parts and complete membrane roofing systems. In addition, laboratory equipment for simulated weathering and outdoor exposure sites at eight different climatic areas. A staff with special skills and knowledge on this subject.

Project Number:
4212447

Project Leader:
Thomas H. Boone

Funding: $25 K

Project Initiation Date:
January 1966

Completion Target Date:
N/A

Persons to contact for further information:

Thomas H. Boone
Room B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3371

Notes: N/A

421.04

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Performance of Flooring

KEYWORD: Adhesion; bond; floor coverings; performance requirements; resilient types; seamless types; test methods; wear resistance

Project Number:
4212448

Project Leader:
Winthrop C. Wolfe

Funding: $10 K
Tris

BACKGROUND: Flooring problems in military bases have been studied by NBS, BRD for 15 years. A major problem is concrete floors in WWII buildings. Monolithic surfacings often fail to bond, and crack due to heavy traffic and heat from cooking ranges and hot water heaters. Some surfacings do not wear well.

Project Initiation Date:
January 1966

Completion Target Date:
N/A

RESEARCH EFFORT: Promising resurfacing systems for contaminated concrete floors have been developed and tested in our laboratories. Various floor coverings and surfacings have been observed in the field and tested in the laboratory for bond, heat resistance and wear.

Persons to contact for further information:

Mr. W. C. Wolfe
Room B348, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Field observations over a 13-year period were summarized in an article in FLOORING. A report is being prepared on laboratory adhesion tests for floor coverings and surfacings for contaminated concrete. Especially promising are asphalt modified epoxy surfacing and abrasive sheet vinyl floor covering.

Notes: This research is described in FLOORING, Nov., 1968, p. 52; NBS Tech. News, STR 3763; NBS Report 9806.

TECHNICAL CAPABILITIES Load-strain testing machine; portable dynamometer for field testing adhesion of floor coverings and surfacings; equipment for cement testing and for mixing and finishing concrete.

421.04

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Organic Coatings Evaluation

KEYWORD: Acceptance tests; organic coatings; sealants

Project Number:
4213647

Project Leader:
Paul G. Campbell, Ph. D.

Funding: $21.0 K

BACKGROUND: Various Government agencies require that organic coatings, sealants and related materials be tested for compliance to specifications before use. The reports serve to inform the agencies of the quality of the materials examined and also provide consultative and advisory services supported by laboratory data.

Project Initiation Date:
January 1966

Completion Target Date:
N/A

RESEARCH EFFORT: At the request of Government agencies, including D. C. Government, NAVFAC, FAA, Maritime Administration, HDL, Naval Academy, Mississippi Department of Highways, NCHA, etc., acceptance tests were performed on a total of 96 samples of organic coatings and related materials to determine compliance to designated specifications. Tests were also performed on 9 samples of sealants and caulking compounds.

Persons to contact for further information:

Paul G. Campbell, Ph. D.
Room B348, Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Test reports were prepared on all the samples submitted. These reports provide consultative and advisory services supported by laboratory data. They also provide our staff with the opportunity to maintain and improve their competence in testing procedures, and to assess the adequacy of these methods.

Notes: This research is fully described in the test reports submitted by the requesting government agencies.

TECHNICAL CAPABILITIES A complete coatings and sealants testing laboratory, capable of testing the physical and chemical properties of the above materials by standard test methods.

421.04

PROJECT TITLE: Evaluative Techniques for Plastics, Bitumens and Sealants

KEYWORD: Performance; test methods; thermal analysis; durability

BACKGROUND: The rapid growth of the use of plastic materials and composites in buildings concomitant with the continued use of bituminous roofing materials requires the continuous development of new and improved test methods for the evaluation of the performance and durability of these materials in buildings.

RESEARCH EFFORT: Two new techniques were investigated for applicability to the problem of evaluating durability of plastics and bitumens. The first technique uses a gas chromatograph to determine the relative amount of oxygen versus nitrogen gases surrounding the materials as a function of exposure time.

A thermo-mechanical analyzer device allows the rapid determination of the change of a material from a hard-rigid material to a soft material. A series of 20 roofing asphalt samples were measured before and after heat treatment to evaluate the changes that may occur during the roofing application.

RESULTS: Differences between several plastics and bitumens were readily observed by the first technique.

The second technique showed changes in the samples studied very closely. Correlations of this data with softening points and bulk viscosity before and after heat treatment is underway.

TECHNICAL CAPABILITIES A dual column, programmable gas chromatograph with all necessary accessories; the control console of a thermo-analysis instrument; and a parallel-plate plastometer with temperature control for room temperature to 150°C, as well as both carbon-arc and Xenon arc weather-ometers and numerous outdoor weathering sites are available.

Project Number:
4216201

Project Leader:
M. Tryon

Funding: RTS
$39,000

Project Initiation Date:
June 1967

Completion Target Date:
June 1973

Persons to contact for further information:

Mr. Max Tryon
Room B348, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3441

Notes: N/A

421.04

PROJECT TITLE: Correlation of Simulated and Actual Exposure of Building Materials

KEYWORD: Outdoor exposure; building materials

BACKGROUND: The Materials Durability and Analysis Section has long recognized the urgent need to correlate the results of laboratory testing of building materials with the actual durability performance of these materials in field service.

RESEARCH EFFORT: In order to obtain data from controlled outdoor exposure testing of building materials, the Materials Durability and Analysis Section undertook the establishment of a series of test sites to include a wide range of climates and environments prevailing throughout North America.

RESULTS: Seven test sites have been established and are operational. There are ten specimen racks installed at each site and these racks are now approximately 60-70% filled with test materials. Locations of the sites are as follows: NBS, Gaithersburg, Md.; Fort Holabird, Baltimore, Md.; Roosevelt Rds Naval Sta., Puerto Rico; Nellis AFB, Nevada; Fort Lewis, Wash.; Fort Greely, Alaska; and U. S. Coast Guard Sta., Cape May, New Jersey.

TECHNICAL CAPABILITIES The test sites are available for future test programs; good relations have been established with local personnel at the remote military facilities, thus enabling the routine placement and removal of specimens to be handled by correspondence.

Project Number:
4216202

Project Leader:
Joseph W. Pitts

Funding: $25.0 K
RTS

Project Initiation Date:
July 1, 1968

Completion Target Date:
N/A

Persons to contact for further information:

Warren D. Hayes, Jr.
B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes: An article describing the test sites was published in the NBS, TNB, June 1969.

421.04

PROJECT TITLE: Durability and Analysis of Inorganic Building Materials

KEYWORD: Concrete; gypsum; lime

BACKGROUND: This project was established in FY 70 for the purpose of attaining competence within the BRD on inorganic building materials, especially their chemical behaviors. Studies have been initiated in three areas: concrete, gypsum and lime.

RESEARCH EFFORT: Commenced to complete a study on concrete specimens subjected to a 16-year weather exposure. Whether the durability of the specimens can be predicted from the laboratory studies resulting in BSS-Interrelation Between Cement and Concrete Properties is the major concern of this study.

Investigations have been carried out on the products formed between $CaSO_4$ and H_2O. Their properties have been elucidated by vacuum line techniques, scanning electron microscope, and differential thermal analysis.

Plans have been formulated to study the delayed expansion of limes caused by unhydrated magnesium oxide, with the intention of establishing Federal Specifications.

RESULTS: The manuscript Compilation of Data from Laboratory Studies which will constitute part 6 of BSS-Interrelations Between Cement and Concrete Properties was prepared for publication.

TECHNICAL CAPABILITIES Research laboratory was equipped and a vacuum line constructed.

Project Number:
4216205

Project Leader:
J. R. Clifton

Funding: $40,000

Project Initiation Date:
July 1968

Completion Target Date:
To be determined

Persons to contact for further information:
Dr. J. R. Clifton
Room B348, Building Research
National Bureau of Standards
Washington, D. C. 20234
Phone: 921-3407

Notes: N/A

421.04

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Test Method for Hail Resistance of Asphalt Shingle Roofing

KEYWORD: Hail resistance; roofing

Project Number:
4216364

Project Leader:
R. G. Mathey

Funding: 4.0 K
3M Company

BACKGROUND: The 3M Company provided partial support for the NBS to develop measurement techniques to determine the comparative influence of protective granule grading on the hail resistance of asphalt shingles. It had been shown in an earlier study on the hail resistance of built-up roofing that comparable roofing with larger size aggregate surfacing increased the hail resistance of roofing.

RESEARCH EFFORT: Fifteen types of commercial asphalt shingles were obtained. The variables associated with the shingles were granule size, weight of asphalt coating, type of felt and type of asphalt. Specimens simulating sections of new roofs and reroofing were prepared and subjected to impact of simulated hailstones (ice spheres) from an air-powered hail gun. Impacted areas were measured and some of the specimens were placed on exposure racks to study the effect of exposure conditions on the performance of roofing subjected to various degrees of hail damage.

Project Initiation Date:
July 1, 1969

Completion Target Date:
December 31, 1970

Persons to contact for further information:

Robert G, Mathey
Room B348, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Test methods and criteria were developed for carrying out hail resistance tests, techniques for measuring and evaluating hail damage were developed and proposed performance criteria for hail resistance of roofing was recommended. The experimental phase of the study and most of the evaluation has been completed. A final report is being prepared.

TECHNICAL CAPABILITIES A hail gun system capable of firing ice spheres ranging in size from 3/4 to 2 1/2-inches in diameter at speeds corresponding to those that would be expected in a hail storm (91 to 134 ft/sec), production of ice spheres and fabrication of specimens representing most all types of roofing.

Notes: This research is partly described in NBS Report 10193, Hail Resistance Tests of Aluminum Skin Honeycomb Panels for the Relocatable Lewis Building, Phase II, April 10, 1970.

421.04

PROJECT TITLE: Porcelain Enamel Institute Research Associateship

KEYWORD: Porcelain enamel; test methods

BACKGROUND: The Porcelain Enamel Institute has maintained a Research Associateship program at the National Bureau of Standards since 1937. The goals of this program are to develop standardized tests for quality control of porcelain enamels in accordance with the needs of the porcelain enamel industry.

RESEARCH EFFORT: During FY70 research of the PEI Research Associates has focused on 1) developing an understanding of the mechanisms of adherence of porcelain enamel to aluminum in order to develop a test to accurately predict the adherence of all porcelain enamel-aluminum systems, 2) developing a test for the adherence of direct-on porcelain enamels on steel, 3) the weatherability of nature-tone enamels on steel, 4) developing a test for the cleanability of porcelain enamels, 5) developing a test for continuity of porcelain enamel coatings and 6) the weatherability of porcelain enamels on aluminum.

RESULTS: Studies of porcelain enamel-aluminum interfaces indicate that good adherence results from an interaction between some constituents of the aluminum alloy and the enamel. Methods have been developed to measure adherence of direct-on porcelain enamels and the continuity of porcelain enamel coatings. The weatherability of porcelain enamels on aluminum after three years exposure is described in B.S.S. No. 29.

TECHNICAL CAPABILITIES Scanning electron microscope; PEI adherence meter; 0-2000 pound Elcometer adhesion tester; 0-5 kv continuity of coating tester; Gardner Color Difference Meter; and 45° Specular Gloss Meter.

Project Number:
4216371

Project Leader:
M. D. Burdick

Funding: 2 man years, plus overhead, plus $2K

Project Initiation Date:

1937

Completion Target Date:

Continuing project

Persons to contact for further information:

M. D. Burdick
B348, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes: N/A

421.04

PROJECT TITLE: The Effects of Atmospheric Contaminents on the Durability of Building Materials

KEYWORD: Air pollution; building materials

Project Number:
4216415

Project Leader:
Harvey Berger

Funding: $30.0 K

BACKGROUND: The effects of air pollutants on the durability of building materials are among the least quantified of all weathering parameters. The chemical and physical mechanisms by which pollutants degrade the performance and appearance of organic coatings, such as paints, plastics and asphalts, and the measurements thereof, are prerequisite to determinations of the economic losses due to air pollution.

Project Initiation Date:
July 1967

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: A variety of materials was exposed to controlled laboratory environments in accelerated weathering machines which simulate natural sunlight. Sulfur dioxide and ozone levels of 2 P.P.M. and 0.5 P.P.M. respectively, were maintained in the environmental test chamber in two basic experiments. Materials were also exposed outdoors at test sites at NBS, Gaithersburg, Md., and Fort Holabird, Baltimore, Md. These locations, which are rural and urban industrial respectively, have similar weather characteristics but differ significantly in the types and amounts of air pollution. Changes in materials properties were measured with respect to their exposure histories.

Persons to contact for further information:

Harvey W. Berger
Room B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3371

RESULTS: Weathering effects are generally more severe in an SO_2 environment than in an Ozone or control atmosphere. Outdoor exposures at Ft. Holabird, which has high SO_2 concentration levels, resulted in more significant deleterious effects than exposure at NBS. Airborne particulate matter emerged as an air pollutant of major concern as it affected the appearance of organic coatings.

Notes: A final report will be submitted in the near future.

TECHNICAL CAPABILITIES Facilities for accelerated weathering in Xenon and Carbon arc weathering machines; exposure sites equipped with air pollution and radiant energy monitoring devices; testing machines and apparatus for measuring the tensile strength and elasticity of paints and plastics, scratch resistance, adhesion, color and gloss; instrumentation for infra-red analysis, thermo-mechanical analysis, coulometric analysis.

421.04

PROJECT TITLE: Performance of Exterior Siding

KEYWORD: Siding, exterior residential

Project Number:
4216416

Project Leader:
L. F. Skoda

Funding: $25,000 NAVFAC

BACKGROUND: The project is designed to develop test methods and techniques to predict the long-term in-service performance of exterior sidings on the basis of short-term tests. The test results are intended to provide a basis for specifying exterior siding materials for housing projects in order to improve the service life of this high maintenance cost item.

Project Initiation Date:
January 1969

Completion Target Date:
December 1970

RESEARCH EFFORT: A need for research of high maintenance cost items, i.e., exterior sidings, was established by the Naval Facilities Engineering Command. A series of evaluative tests were performed on 12 systems including 63 colors of exterior siding including, solid vinyls, masonites and aluminum substrates. The tests used were natural & artificial weathering, salt spray, humidity resistance, abrasion, mar and adhesion resistance, cleanability, and impact resistance (hail gun). The effects of weathering were evaluated by color and gloss changes.

Persons to contact for further information:
Mr. L. F. Skoda
Room B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: The results of the testing program will be used to establish limits for performance criteria. These performance criteria will establish a basis for performance specifications to be used in procurement of cladding materials or systems for new construction or rehabilitation of existing structures by the Naval Facilities Engineering Command. The performance specification is being prepared at this time.

Notes: N/A

TECHNICAL CAPABILITIES Laboratory equipment is available for performing all of the tests indicated above. Additional equipment for evaluation studies such as infrared and atomic absorption spectrophotometers, a differential thermal analyzer and gas chromotography equipment. Eight exposure sites from Alaska to Puerto Rico are also available for natural weathering studies.

421.04

PROJECT TITLE: Laboratory Aging Tests of Sandwich Panels

KEYWORD: Sandwich panels; aging tests

Project Number:
4216421 (See project 4215421) for reports.

Project Leader:
V. Eugene Gray

Funding: $1.0 K

BACKGROUND: The Naval Facilities Engineering Command had the assignment to test the various commercially available sandwich panels which might be suitable for lightweight portable structures.

Project Initiation Date:
May 1, 1969

Completion Target Date:
July 23, 1969

RESEARCH EFFORT: Under contract with the Naval Facilities Engineering Command, the Building Research Division developed and carried out a test program to evaluate sandwich panels from three different manufacturers. These were evaluated by measurement of compressive strength before and after aging tests. Aging tests (according to ASTM C-481) were carried out on the three proposed materials.

Persons to contact for further information:

Thomas Reichard
Room B156, Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3475

RESULTS: The three panel materials were found to respond quite differently to these aging tests.

One panel suffered almost complete loss of adhesion between the metal substrate and the paper honeycomb while one product showed almost no loss of strength. The physical testing was performed under project 4215421.

Notes: N/A

TECHNICAL CAPABILITIES No unusual capabilities to report.

421.04

PROJECT TITLE: Evaluation of Industrial-Type Protected Metal Building Sheets

KEYWORD: Industrial siding; protected metal

BACKGROUND: In order to update Guide Specifications, the military services need to obtain laboratory and weathering exposure data on the performance and durability of industrial-type protected metal building sheets.

RESEARCH EFFORT: The objectives of the project are being accomplished by 1) performing accelerated laboratory tests on representative samples of materials, 2) determining the weathering behavior of replicate specimens of these materials by exposing them at the seven NBS outdoor exposure test sites, and 3) conducting field surveys of existing buildings. The data from these three sources will be analyzed to determine what correlations exist between short-term laboratory tests and long-term service performance.

RESULTS: Representative sample materials were obtained from manufacturers and specimens were put on exposure at the seven outdoor test facilities. Replicate specimens were tested in the laboratory, utilizing the following test methods: salt spray, single and twin carbon arc weatherometers, jet abrasion, and cyclic condensation. Gloss and color change measurements were made after testing.

TECHNICAL CAPABILITIES The following laboratory facilities are available: salt spray (fog) cabinet, weatherometers, Roberts Jet Abraser, cyclic environmental tester, hail gun, Rockwell Vickers and Knoop Hardness Testers.

Project Number:
4216446

Project Leader:
Joseph W. Pitts

Funding: $25.0 K
Tri-Service

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1971

Persons to contact for further information:

William C. Cullen, Chief
Materials Durability and
Analysis Section
B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3458

Notes: A summary report of the first years' activities on this project is contained in NBS Report No. 10 269.

421.04

PROJECT TITLE: Weatherability of Plastics

KEYWORD: Weatherability; plastics

Project Number:
4216640

Project Leader:
Dr. Joseph E. Clark, Ph. D.

Funding: $5.0 K

BACKGROUND: The increased usage of plastics as an outdoor building material has raised the demand for accelerated weathering tests to improve predictions of service life.

Project Initiation Date:
April 1967

Completion Target Date:
April 1970

RESEARCH EFFORT: The elements of weather that are important forces in the aging of a number of plastics have been identified and their effects have been studied. A device was developed that provided the capability of increasing the magnitude of these forces singly or in unison. A program of outdoor exposure in three widely different environments has been in progress for four years. Tensile, flexural, haze, color and gloss measurements on samples drawn annually have been and will continue to be made until samples disintegrate.

Persons to contact for further information:

Max Tryon
Room B348 Building Research
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3441

RESULTS: The following reports were issued this year in the "Outdoor Performance of Plastics" series: III. Statistical Model for Predicting Weatherability, NBS 10 116; IV. Significance of Climate, NBS 10 156; V. Surface Roughness, NBS 10 179; VI. Electrical Properties, NBS 10 185; VII. Haze & Gloss, NBS 10 188.

Notes: N/A

TECHNICAL CAPABILITIES Computer equipment and trained personnel are available for reduction of the data provided by member companies of MCA and tabulation of the results for the outdoor exposure program.

421.04

PROJECT TITLE: A Two-Year Research Project on the Development of Performance Requirements, Criteria and Tests for Housing Units--Operation BREAKTHROUGH

KEYWORD: Housing systems; performance

BACKGROUND: HUD seeks to improve its guide criteria for the evaluation of housing in performance terms. Applications could be in direct procurement of actual housing systems or indirectly in the various standards defining the quality of housing. A specification method is required which does not inbibit technological innovation or prevent the application of a wide range of products and designs.

RESEARCH EFFORT: The method proposed to obtain the necessary criteria in terms of the user is derived from user activities and user behavior in the activities associated with the interior of the housing unit. Place-related activities are associated with attributes of space and environmental media as prerequisites for the activities occur; i.e., personal sanitation, food preparation, sleeping, etc. Performance Criteria is set at the thresholds of perception for acoustics, color fastness and vibration for assemblies. Criteria for the performance of surfaces correlates exposure in-use, product ingredients and desired properties. Criteria for subsystem assembly performance will be based on correlations between life cycle cost, allowable expenditure on operation based on income, and levels of attributes affordable. Criteria for user activity performance correlates activities, behaviors and effects at the threshold of impairment, interruption or interference.

RESULTS: The first report documenting tasks associated with surveying conditions of exposure (users and hardware) has been submitted to HUD.

TECHNICAL CAPABILITIES Resource allocations of available testing skills, research expertise, and the incorporation of performance requirements, criteria and tests into specification form. The work bridges the gap between research and the design and procurement technologies associated with housing systems.

Project Number:
4213401

Project Leader:
Thomas E. Ware

Funding:
$80,000 HUD FY'70
325,000 HUD FY'71
245,000 HUD FY'72

Project Initiation Date:
April 21, 1970

Completion Target Date:
June 30, 1972

Persons to contact for further information:

Thomas E. Ware or
Phillip C. Jones
Room A365, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Telephone (301) 921-3595

Notes:

421.06

PROJECT TITLE: Urban Technology

KEYWORD: Urban systems; performance criteria

Project Number:
4217111

Project Leader:
R. W. Blake
T. E. Ware

Funding: $48,126.

BACKGROUND: Other agencies are beginning to seek research efforts which provide performance information in the broad areas of community development. Generally a better fit is sought between policies, programs, participants, the development process and variables of performance correlating utilities, services and built environments.

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: The Building Systems Section of the Building Research Division has been assigned the task of developing a systems research plan essentially made up of user based long range research projects. The comprehensiveness and complexity of the program stems from documentation of where decision costs and functions actually occur in the total building process; i.e. progress from policies to programs, from programs to participants, from participants to process, from process to product.

Persons to contact for further information:

Thomas E. Ware or
Philip C. Jones
Room A365, Building 226
National Bureau of Standards
U.S. Department of Commerce
Washington, D. C. 20234
Telephone (301) 921-3595

RESULTS: Those attributes of the community development process which specifically deal with the performance of housing systems were identified and incorporated into BRD project 4213401.

Mr. Jan VanEttinger, director of the Bouwcentrum (Netherlands) was invited to a seminar conducted by the Building Systems Section to explore approaches to problems associated with community development which are common to both the U.S.A. and the Netherlands.

Notes: A continuing project.

TECHNICAL CAPABILITIES Environmental psychology (user activity analysis), building economics (cost of decisions in community development), urban systems technology, performance attribute identification correlated to stages in the community development process.

421.06

PROJECT TITLE: Building Economics

KEYWORD: Building economics

Project Number: 4217112

Project Leader:

Carleton Coulter, III

Funding: 23,320. NBS

BACKGROUND: Building Economics is of increasing interest because it is useful in allocating resources more effectively.

Project Initiation Date:

May 1, 1969

Completion Target Date:

June 30, 1970

RESEARCH EFFORT: The program concerns four research project areas:

a) Building Cost data--real data generated only in the construction and in-use phases.

b) Building cost information-synthesis of cost data and knowledge derived, especially for decisions.

c) Building cost management-proper utilization on scheduling of resources throughout the life of a building.

d) Building economics-basic research in how society chooses to employ scarce resources to produce buildings over time.

Persons to contact for further information:

Dr. Carleton Coulter, III
Program Manager, Building Economics
Room A-365, Building 226
Building Systems Section
Building Research Division, IAT

RESULTS: Federal workshops in building economics and economics of flooring were held. Detailed study of U.S. and foreign efforts in building economics. Recommended program is Joint Federal Agency Program of $1.5 M over a three year period. Assistance to other BRD sections on building cost decisions and engineering economy. Program of forty research tasks.

TECHNICAL CAPABILITIES: Increased staff to cope with this problem area. Development of a life cycle concept for facilities, a methodology for lease-buy alternatives and study of the economics of standardization in the building industry scheduled for FY'71.

Notes: Part of this research is described in a report, "A Life Cycle Concept for Buildings and Facilities," and report "Life Cycle Facility Planning-a Methodology" to be published Oct. 1970. A report on Building Economics 421.06 was previously furnished to program sponsors.

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Technical Awareness

Project Number: 4217115

Project Leader:
Carleton Coulter, III, P.E.

KEYWORD: Technical forecasting; research management

Funding: $ 4,270. NBS

BACKGROUND: The appropriateness of research and the timeliness of research results is of increasing concern to management in order to properly allocate resources for numerous research projects. Technical forecasting and other techniques are now acceptable tools and an intregal part of long range planning for research.

Project Initiation Date:
December 1, 1969

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: Synergistic Cybernetics Inc. was retained to study long range planning for the Building Research Division and conduct a course on Technical Forecasting. An off size long range planning session was held to define the BRD objectives and develop pilot programs. A federal workshop, for all agencies was held in techniques of forecasting and research management. A source library was established in econmic forecasts and alternative futures. Present accounting methods were explored to better determine budget expenditures vs. operations. A technical audit was conducted of all FY'70 projects against twelve benefit criteria.

Persons to contact for further information:

Dr. Carleton Coulter, III
Program Manager, Building Economics
Room A-365, Building 226
Building Systems Section
Building Research Division, IAT

RESULTS: A format and a list of required forecasts were developed. A technical forecast, the first of a series was developed. A means of ranking research projects vs. objectives was developed. A computerized accounting division system was developed.

Notes:

TECHNICAL CAPABILITIES: Understanding by program leaders of the use of technical forecasts in research planning. Establishment of an internal capability to conduct forecasting as part of long-range research planning. Forecasting program incorporated as a task of Building Economics Program. Forecast on building codes to be developed in FY'71.

421.06

PROJECT TITLE: PBS/NBS Federal Office Building-Building Systems

Project Number: 4217416

Project Leader:

Robert W. Blake

KEYWORD: Building systems; performance specification

Funding: $167,000. FY'70 PBS

BACKGROUND: The Public Buildings Service is exploring ways to decrease the costs and construction times, and to improve the quality of its building operation. The typical office space portion of PBS F.O.B.'s was identified as a lively area for such improvements, employing a performance specification and new contracting procedures to procure innovative building systems.

Project Initiation Date:
June 1966

Completion Target Date:

September 30, 1970

RESEARCH EFFORT: A study of the needs of Federal office space was undertaken, in relation to needs of office space in the private sector. A matrix format for the development of performance specifications was derived, as well as a language in which to clearly present the information (requirement, criteria, test). The state-of-the-art of performance requirements was surveyed and decisions on applicability to this project were made. Alternative contracting procedures were analyzed. Liaison with the building identified was maintained.

Persons to contact for further information:

Thomas E. Ware
David B. Hattis
Room A-365,Building 226
NBS
U.S. Dept. of Commerce
Washington, D. C. 20234
Phone: 921-3595

RESULTS: A performance specification and contract documents for the procurement of approximately 1,000,000 square feet of F.O.B. office space was produced, circulated to industry for feedback and finally revised and edited. It is now ready for use in a two-part Federal procurement action.

Notes: The work in progress was described in the Project Status Report No. NBS 9668. The Performance Specification and Documents will be available in the fall of 1970.

TECHNICAL CAPABILITIES: The development of expertise and a format for developing performance specifications for the procurement of any repeatable building type.

421.06

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Cost Analysis/Cost Synthesis

KEYWORD: Building cost data; standard language

BACKGROUND: Retrieving and exchanging building cost data among Federal agencies is a major problem. Little data is available on the cost/time/performance of building materials, components and subsystems.

RESEARCH EFFORT: There are four principle approaches:
a) Standard construction cost language allowing exchange of data among agencies.
b) Testing the usefulness and industrial feasibility of bidding lump-sum/unit-price allowing collection of initial costs.
c) Developing an information handling system showing how data can be used in various steps of the building process.
d) Standardizing an operating and maintenance language relating construction costs to life costs.

RESULTS: Phase I-Analysis and Summary consisted of 1) developing a detailed project plan, 2) industrial acceptance survey and 3) study of agency needs. Study of the entire building process where each cost decision is made and information required.

TECHNICAL CAPABILITIES: Establishment of a costing concept for Federal agencies-first step in the development of a cost standard. Project incorporated into Building Economics Program.

Project Number: 4217418

Project Leader:
Phillip T. Chen

Funding: 29.7 K. NBS, VA, NASA (FY'69, POD, HEW, HUD, VA, GSA)

Project Initiation Date:
April, 1968

Completion Target Date:
September, 1970
(Phase I)

Persons to contact for further information:

Phillip Chen, P.E.
Project Manager
Room A-365, Building 226
Building Systems Section
Building Research Division
IAT

Notes: Part of this research is described in a report, "Final Report & Summary-Cost Analysis/Synthesis System for Construction Control," furnished client agencies.

421.06

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Industry and Professional Studies

KEYWORD: Technical information; liaison

Project Number:
4212170

Project Leader:
James L. Haecker

Funding: (RTS)
$83,000

BACKGROUND: An apparent gap exists between the availability of technical information and its relatedness to the building construction process. This project has been undertaken to narrow this gap through information interchange, problem definition and communication between building researchers and decision makers in the building construction process.

Project Initiation Date:
July 1, 1969

Completion Target Date:
July 1, 1970

RESEARCH EFFORT: The project staff, by developing conferences and symposia, preparing technical information packages, and by implementing new communication techniques, effect the flow of information between various participants in the building construction process. This project is designed to identify problems within the building process and to seek a responsive solution through the application of technical resources and facilities of the Building Research Division.

Persons to contact for further information:

James L. Haecker
Chief, Scientific & Professional
Liaison Section
Building 226, Room B306
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3107

Neil Gallagher
Editor, Building Science Series
(SAME AS ABOVE)

Notes:

RESULTS: Twelve workshops for federal construction agencies have been held in addition to two national conferences concerned with building problems. Numerous audio visual packages and hard copy information packages, i.e. conference preceedings, brochures, and technical reports, have been prepared and distributed to the building community at large.

TECHNICAL CAPABILITIES Capabilities exist to effect the necessary liaison between all participants in the building construction process and the research resources required to approach solutions to building problems.

421.07

PROJECT TITLE: National Conference of States on Building Codes and Standards

KEYWORD: Regulations; evaluation; codes; standards

BACKGROUND: In 1967 several States met with NBS to discuss need for cooperation in evaluation of building assemblies, components and materials and other State regulatory system needs. A formal organization was approved by the States and NBS in the Spring of 1968; 2nd annual meeting approved Constitution and Bylaws in Spring of 1969 (FY-69).

RESEARCH EFFORT: Assistance in regulatory systems analysis and program development. Development of national committees in standards and evaluation, education and qualification of building regulatory personnel and computer technology in data gathering and administrative operations.

Development of a national interstate coordinated effort for dissemination of standards and evaluation information towards uniformity in codes and acceptance (approval) procedures.

RESULTS: All States presently have endorsed NCSBCS scope and activities. Forty States have Executive or Legislative Committees actively studying and/or developing Statewide regulatory programs. Twenty-three States have introduced varied types of regulatory legislation. Nine States have adopted regulations which approve industrialized housing for Statewide usage and are working together towards interstate acceptance criteria and procedures.

TECHNICAL CAPABILITIES: Code analysis, technical assistance, State program and legislative assistance. Comprehensive building evaluation assistance.

Project Number: 4211152

Project Leader:
Gene A. Rowland

Funding: 95.5 K

Project Initiation Date:
January 1, 1968

Completion Target Date:
Continuing Program

Persons to contact for further information:

Gene A. Rowland
Charles T. Mahaffey
Robert M. Eisenhard
State Codes & Standards Section
BRD, IAT
National Bureau of Standards
Washington, D. C. 20234
921-3447

Notes: Miscellaneous information regarding State programs, legislation, appointed NCSBCS State delegates, Constitution & Bylaws, Committee activity, reports available.

421.08

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Standards and Model Codes

Project Number: 4212151

Project Leader:
Charles T. Mahaffey

KEYWORD: Model codes; standards; building standards

Funding: 89.5 K

BACKGROUND: Building Research Division has long maintained a participating role in regard to administrative and technical assistance in national building related standards and model codes. This continuing input has assisted in determining research needs for which funds are allocated. The activity funded here is primarily on an administrative level.

Project Initiation Date:

Completion Target Date:
Continuing Program

RESEARCH EFFORT: Primary effort has been in ANSI Construction Standards Board, Safety Standards Board and specific committees such as National Electrical Safety Code, National Electrical Code, Elevator Safety Code, various safety codes.

Persons to contact for further information:

Charles T. Mahaffey
Gene A. Rowland
Harry Shoub
William J. Meese
State Codes & Standards Section
Building Research Division
National Bureau of Standards
Washington, D. C. 20234
921-3447

RESULTS: The continued input of the BRD staff contributes to a viable working system. The activity of the NESC is an example of a good sponsorship and committee production regarding current usable model regulations for the nation's utilities.

Notes: This activity area has been divided in FY-71 into Building Standards (standards) and Regulatory Building Standards (Model codes)

TECHNICAL CAPABILITIES: The staff has close working relationship with standards generating organizations and has the ability to effect changes when found necessary. The staff is also sought continually for administrative counsel suggestions, and technical review for which they have expertise or access to within the Building Research Division.

421.08

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: AASHO Materials Reference Laboratory

KEYWORD: Testing

Project Number: 4212459

Project Leader:

J. R. Dise

Funding: BPR $110,000.00
States 220,000.00

BACKGROUND: The AMRL was established in 1965 to promote uniformity in the testing of soils, aggregates, and bituminous materials in central highway laboratories.

Project Initiation Date:
October 1965

Completion Target Date:
Continuing Program

RESEARCH EFFORT: Laboratories are inspected and soils, aggregates, and bituminous reference samples are distributed to promote uniformity and to evaluate within and between laboratory test results. Laboratory studies are made of testing problems evolving from the inspection and comparative testing programs.

Persons to contact for further information:

J. R. Dise
E. S. Newman
Room 212, Building 226
NBS
Phone: 921-3481

RESULTS: In FY-70, 44 highway soils, aggregates, and bituminous testing laboratories were inspected and two pairs of reference samples of each material were distributed to over 60 laboratories. Numerous revisions in methods of tests were recommended.

Notes:

TECHNICAL CAPABILITIES: Continuation of the inspection and comparative testing programs at present levels and expansion of activities to include other materials or other laboratories, as requested.

421.08

PROJECT TITLE: Cement and Concrete Reference Laboratory

KEYWORD: Testing; cement; concrete

BACKGROUND: The CCRL was established in 1929 to promote uniformity in the testing of portland cement. In 1960, the scope of the work was extended to include the testing of concrete. In 1968, the testing of concrete aggregates was added.

RESEARCH EFFORT: Laboratories are inspected and cement reference samples are distributed to promote uniformity and to evaluate within and between laboratory test results among public and private cement and concrete testing laboratories. Laboratory studies are made of testing problems evolving from the inspection and comparative testing programs.

RESULTS: In FY-70, 147 cement and 132 concrete laboratories were inspected and two pairs of cement reference samples were supplied to 180 laboratories. Studies of the air-entraining characteristics of the standard sands used in the testing of cement were carried forward as time permitted.

TECHNICAL CAPABILITIES: Continuation of the inspection and comparative testing programs for cement and concrete laboratories at present or higher levels and expansion of coverage to include other fields, as requested.

Project Number: 4212451

Project Leader:
J. R. Dise

Funding: Engrs. $2750.00
Navy 500.00
ASTM Research Associates

Project Initiation Date:
April 1, 1929

Completion Target Date:
Continuing Program

Persons to contact for further information:

J. R. Dise
J. W. Haverfield
Room 212, Building 226
NBS
Phone: 921-3481

Notes:

421.08

PROJECT TITLE: Program Planning in Sensory Environment

KEYWORD: Program planning; sensory environment

BACKGROUND: A Sensory Environment Branch was establsihed in Dec. 1968 comprised of an Environmental Engineering Section, a Psychophysics Section, a Building Transport Systems Section, and a Senior Engineering Fellow Office. This concept has involved extensive program planning and staff development.

RESEARCH EFFORT: The design of a new 6-story plumbing research facility and a part of the construction work in Building 226 were completed during FY'70. A research program in plumbing directed toward the more urgent needs for technical information was developed and priorities assigned. Further plans for reorganization of the Sensory Environment Branch to discontinue the Psychophysics Section and to create an Applied Acoustics and Illumination Section in its place were prepared for implementation on July 1, 1970.

RESULTS: Construction of new 2-1/2-story and 6-story plumbing research facilities was partially completed.

Expansion of the research paogram in applied acoustics was initiated. Four new professional staff members were appointed in the acoustics program.

TECHNICAL CAPABILITIES: N/A

Project Number: 4212172

Project Leader:

P. R. Achenbach

Funding: 8.3

Project Initiation Date:

December 1968

Completion Target Date:

June 1970

Persons to contact for further information:

Paul R. Achenbach
Chief, Sensory Environment Branch
Room B-112, Building 226
NBS
Washington, D. C. 20234
Phone: 921-3637

Notes:

421.10

PROJECT TITLE: Thermophysical Properties

KEYWORD: Thermal conductivity; heat transfer; measurement methods

Project Number:
4212231

Project Leader:
Henry E. Robinson

Funding: $40.5 K
RTS

BACKGROUND: This project is to develop measurement methods, apparatus, and reference standards for accurate measurement of thermal conductivity and heat transfer properties of materials and insulations; and to make heat transfer measurements to satisfy requirements of government agencies.

Project Initiation Date:
January 1966

Completion Target Date:
Continuing

RESEARCH EFFORT: An extensive literature research was completed for a comprehensive review paper on theoretical aspects and experimental techniques for determination of the thermal conductivity of metals. The theoretical portion of the manuscript has been written and the complete manuscript will be ready for editorial review by Fall, 1970. Contributions were made to Project 4214136 to examine the experimental thermal performance of a prototype building under time-varying exterior temperature conditions. Mathematical solutions were developed for a new form of guarded hot plate apparatus for measuring the thermal conductivity of building materials.

Persons to contact for further information:

Mr. Henry E. Robinson
Room B116, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 301 921-3637

RESULTS: Plans were made for the construction and operation of the guarded hot plate apparatus.

The proceedings of a seminar on the durability of insulating glass, held at NBS in Nov 1968, were edited and published as BSS-20 dated Feb 1970.

Notes:

TECHNICAL CAPABILITIES Apparatus and developed test methods are available for accurate determination of the thermal conductivity of insulations, building materials, and metals. Capability includes mathematical analysis and solution of many complex heat transfer problems.

421.10

PROJECT TITLE: Heat and Mass Transfer

KEYWORD: Natural convection; air leakage

Project Number:
4212133

Project Leader:
Dr. T. Kusuda

Funding: $61.6 K
(RTS)

BACKGROUND: Heat and water vapor transfer due to air motion within a building and through the building structure is of major importance from the standpoint of evaluating thermal loads, energy usage, moisture condensation and thermal comfort of the occupant. Improvement on existing knowledge is very much needed in this area of natural convection and the dynamic aspects of air leakage.

RESEARCH EFFORT: Laboratory experimentation consists of development of a method of measurement to determine air flow characteristics of naturally vented rooms in buildings and in underground shelters using a high pressure high temperature water modeling technique. Other experimental studies are aimed at revealing dynamic air leakage characteristics of office rooms as influenced by fluctuating outdoor wind conditions. Simultaneous and continuous recordings of outdoor wind velocities, pressure differentials and air leakage is necessary.

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1970

Persons to contact for further information:
Dr. T. Kusuda
Room 307A Bldg. 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone: 921-3522

RESULTS: The hot water modeling technique effort resulted in many high quality photographs that reveal air flow patterns under a variety of room operating conditions. These photographs are being analyzed for publication in technical journals. Experimental design and procurement of major instruments for the dynamic air leakage studies were completed largely by a Guest Worker from Norway. Gathering of data on wind velocity pressure differentials across windows, air leakage from rooms started and effort is continuing.

TECHNICAL CAPABILITIES A hot water modeling tank to simulate and photograph convection air flow patterns; computer programs to analyze natural convection air flow, spectrum characteristics of wind and pressure fluctuation; a sophisticated data acquisition system to record rapidly changing phenomena.

Notes: Drafts of papers on the theory and the photographic technique were prepared. An NBS report describing the water model and summaries of the air infiltration study are being prepared. The paper "Effectiveness Method for predicting Performance of Finned Tube Coils" by T. Kusuda was published in 1970 in ASHRAE Symposium Bulletin, Heat and Mass Transfer To Extended Surfaces.

PROJECT TITLE: Air Cleaning

KEYWORD: Dust measurement; filtration

Project Number:
4212134

Project Leader:
Dr. C. M. Hunt

Funding: $39.7 K
(RTS)

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1970

BACKGROUND: Air filtration is a standard feature of every air conditioning system. However, methods for rating air filters are empirical and there are no generally accepted methods for assessing the effectiveness of general ventilation type air cleaning systems. This problem increases in importance as air conditioning becomes a part of nearly every new large building.

RESEARCH EFFORT: High volume samplers have been investigated as devices for measuring the comparative dust levels upstream, downstream, and in the building area served by air cleaners. Paper tape samplers have been investigated for the same purpose and also as around-the-clock devices to determine the times of maximum dirt generating activity. Techniques for transporting equipment to building locations have been investigated. Laboratory tests have been pursued on the air flow resistance characteristics of a filter medium at different air velocity, and different amounts of dirt load. Preliminary investigation of the possibility of broadening the scope of the project to include indoor air pollution has been made.

RESULTS: (1) Improved methods for the field evaluation of air cleaning systems have been developed. (2) A method of calculation has been developed for predicting roll filter performance from parameters measured with a panel filter of the same medium. (3) A literature survey has been performed, and plans have been developed for broadening the project to include measurement of gaseous pollutants, chemical analysis of particulates, mathematical modeling of indoor-outdoor pollutant relationships and tracer measurement of air movements in buildings.

TECHNICAL CAPABILITIES Four high volume samplers, four paper tape samplers, a Royco aerosol counter, a Coulter particle counter for particles in liquids, a 2500 cfm test duct, and the back up capabilities of NBS in chemical and physical measurement.

Persons to contact for further information:
Dr. C. M. Hunt
Room A326, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3512

Notes: A manuscript "Analysis of Roll Filter Operation Based on Panel Filter Measurements" by C. M. Hunt has been prepared.

421.11

PROJECT TITLE: Heating and Cooling Load Calculations

KEYWORD: Computers; energy calculations; response factors

Project Number:
4212239

Project Leader:
Dr. T. Kusuda

Funding: $35.1 K

BACKGROUND: Although many computer programs to determine heating and cooling loads for environmental design do exist, there are several areas where the vital input data or calculation methods are inadequate. This project is to provide information necessary to improve the existing calculation methodology and input data.

Project Initiation Date:
July 1, 1969

Completion Target Date:
Continuing

RESEARCH EFFORT: When a rigorous and exact computative method is applied to the heating and cooling load calculations for the purpose of hour by hour determination of energy requirements, computer time involved becomes prohibitively large. Effort has been continued since FY 1969 to develop routines to produce building response factors, which are second generation numerical factors to permit simple arithmetic operations for the annual energy calculations.

Persons to contact for further information:

Dr. T. Kusuda
Room 307A, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3522

RESULTS: The filtering technique of Wiener was successfully applied to yield a set of building response factors due to outdoor air temperature, solar radiation and electrical lighting for a single room building. These sets were obtained from the results of exact calculations performed on the same building for a period of two weeks.

Notes: Partial detail of this research is described in a forthcoming ASHRAE publication entitled "Heating and Cooling Load Calculations for the Computerized Determination of Energy Requirements."

TECHNICAL CAPABILITIES Computer program to obtain filtering function (convolution function) for stationary time series; several other computer programs to evaluate building thermal loads, room temperature fluctuation, psychrometric properties, solar radiation and response factors.

421.11

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Standards for Refrigeration Components

KEYWORD: Refrigeration

Project Number:
4212435

Project Leader:
C. W. Phillips

Funding: $137.4 K
OA, DOD Army

BACKGROUND: The broad objective of this project is to evaluate and determine the performance of specially-designed refrigeration (and heating) systems of the U. S. Army Natick Laboratories for suitability for military field use.

Project Initiation Date:
July 1, 1969

Completion Target Date:
continuing

RESEARCH EFFORT: The effort involves a large series of performance tests on gasoline engine-driven refrigeration units and other energy sources and the thermal performance evaluations covering a range of sizes of insulated enclosures. These tests are done under a variety of environmental conditions to establish optimum redesign requirements.

Persons to contact for further information:

C. W. Phillips
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3512

RESULTS: Thermal and air leakage performance tests were completed on 3 insulated containers. A refrigerated trailer was redesigned and refitted for test. The performance of these LPG gas refrigerators was determined and two types of engine-driven refrigeration units were evaluated for cooling capacity, control and adaptability for military applications. A shock drop-test was devised and implemented.

Notes: Monthly progress reports were prepared and several interim reports were drafted.

TECHNICAL CAPABILITIES Environmental chambers capable of control over a range of temperature from -35 to 150°F with relative humidity control from 15 to 85%. A dynamometer for small engine testing. Instrumentation and data acquisition systems.

421.11

PROJECT TITLE: Heat Transfer in Underground Protective Shelters

KEYWORD: Earth temperature

Project Number:
4212436

Project Leader:
Dr. T. Kusuda

Funding: $22.6 K
(OA, DOD, OCD)

BACKGROUND: For the evaluation of heat transfer from underground installations, the Office of Civil Defense recognizes the importance of earth temperature as affected by various surface weather conditions. This study is to yield basic information needed to estimate the effect of earth surface condition upon the underground temperature.

Project Initiation Date:
July 1, 1969

Completion Target Date:
Continuing

RESEARCH EFFORT: Earth temperature data have been collected for the past two years on an hourly basis at the geometrical centers of five different patches representing paved, paved and painted white, bare, short grass covered, and long grass covered surfaces. The thermocouples were installed at selected intervals to the depth of 30 ft. Special precaution was taken to minimize the probe conduction errors and noise pick-up in the transducer lines.

Persons to contact for further information:
Dr. T. Kusuda
Room B307, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

RESULTS: The data acquisition was completed at the end of February and data are being processed to yield annual profiles of earth temperatures at various depths as functions of surface weather conditions as well as the surface heat absorbing characteristics. Other data such as surface heat flow, soil moisture content, and solar reduction are included.

Notes: Instrumentation system has been reported on an ASHRAE symposium paper entitled "An Automated Earth Temperature Station" and in detail in NBS Report No. 10222 "An Automated Earth Temperature Station."

TECHNICAL CAPABILITIES Underground automated data acquisition telephone transmission station specifically designed to gather undisturbed earth temperature; various computer programs to analyze and plot the data; many years' experience in analyzing earth temperature data.

421.11

PROJECT TITLE: Consultation and Advisory Services to the U. S. Post Office Department

KEYWORD: Consulting

Project Number:
4213419
4213417

Project Leader:
T. Kusuda
C. W. Phillips
C. Hunt

Funding: $22.5 K
Post Office

Project Initiation Date:

July 1, 1969

Completion Target Date:

June 30, 1970

BACKGROUND: Advisory and consulting services are given in three areas: 1) Evaluation of POD computer program for heating and cooling energy calculations, 2) evaluation of experimental data measuring thermal performance of three POD buildings and 3) assistance in evaluating air contamination and thermal environment effect upon mail sorting machine.

RESEARCH EFFORT: The various critical subroutines for the computer program were studied to examine how closely the ASHRAE calculation methods were followed. The thermal data from three experimental buildings were being analyzed with respect to the measurement technique, sensor stability, calibration of apparatus, and data consistency for the heat balance. Visits were made to Chicago POD buildings to provide assistance to the GARD/GATX* experimental programs on air contamination and thermal environment on mail sorting machines.

*General American Transportation, i.e.: a research contractee of USPOD

RESULTS: Computer programs for thermal load calculations were checked and sample runs were made on mobile post office buildings to see the general operating capability of the program. The evaluation of the system simulation portion of the program is still not completed. The data analysis for two Postal buildings (Wilkes-Barre and Mobile, Ala.) was completed. Studies of the efforts of air contamination and thermal conditions upon postal machines were completed by GARD/GATX and the evaluation of their report has started.

TECHNICAL CAPABILITIES Various computer programs to determine building thermal performance; experienced engineer programmers to handle digital data or tapes, discs and drums. Skilled experimentalists to check the instrument calibrations and sensor installation. Well equipped air filter laboratory, instrumentation, and back-up laboratory facilities.

Persons to contact for further information:

Dr. T. Kusuda
Mr. C. W. Phillips
Dr. C. M. Hunt
Environmental Engineering Sec.
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

Notes:

421.11

PROJECT TITLE: Miscellaneous Environmental Engineering Tests - Public

KEYWORD: Thermal conductivity: reference measurements

BACKGROUND: The objectives of this project are to provide industry with thermal conductivity reference materials for standards, and to supply data on new materials over a wide range of conductivities and temperatures using NBS methods.

RESEARCH EFFORT: On a fee basis the thermal conductivity was determined in the temperature range 0 to 130° F on reference materials for 14 commercial and industrial laboratories. The thermal conductivity, electrical resistivity, and thermoelectric power of a specimen of constantan was determined in the temperature range -150 to 550° C for the Rocketdyne Corporation.

RESULTS: The 14 reference samples and metal bar including their measured thermal conductivity values were furnished to industry for use in calibration of their apparatus.

TECHNICAL CAPABILITIES A guarded hot-plate apparatus conforming to ASTM Method of Test C177 temperature range 0 to 130° F mean temperature. Metals apparatus--temperature range -150 to 800° C.

Project Number:
4213633

Project Leader:
T. W. Watson

Funding: $9.2 K (Reimbursable)

Project Initiation Date:
July 25, 1969

Completion Target Date:
Continuing project

Persons to contact for further information:
T. W. Watson
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

Notes: This work resulted in NBS Report 10126 and 14 letter reports to the sponsors.

421.11

PROJECT TITLE: Miscellaneous Environmental Engineering Tests - Government

KEYWORD: Air cleaner performance; thermal conductivity; heat transfer devices

BACKGROUND: The objectives of this project are to obtain data by laboratory tests on the performance of air cleaners, to provide thermal conductivity reference materials, and to supply performance data on new materials and devices over a wide temperature range.

RESEARCH EFFORT: On a fee basis, the performance was determined on five air cleaners - four for GSA and one for Corps of Engineers, North Pacific Labs., NASA - Langley, and Mare Island Naval Shipyard. Air leakage rates and refrigeration performance were determined on a multi-purpose refrigeration van container for USDA.

RESULTS: The air cleaner reports were submitted to the respective agencies for use for purchase specification purposes. The thermal conductivity results to Mare Island were for calibration reference, the Corps of Engineers data on new materials in connection with "Libby Dam" and NASA values for silicone rubber for calibration purposes. The USDA Multi-Purpose Van Container: obtain data to improve and develop more uniform temperature distribution.

TECHNICAL CAPABILITIES NBS - Air Cleaner Test Method; guarded hot-plate apparatus conforming to ASTM Method of Test C-177 temperature range 0 to 130°F; Metals apparatus - temperature range -150 to 800°F; seven environmental chambers of various dimensions, temperatures, and humidity control ranges -50 to 150°F.

Project Number:
4213648

Project Leader:
T. W. Watson

Funding: $11.8 K
Reimbursable

Project Initiation Date:
July 25, 1969

Completion Target Date:
Continuing project

Persons to contact for further information:

T. W. Watson
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

Notes: This work resulted in three NBS reports, Nos. 10099, 10100, and 10131 - also five letter reports to the sponsors.

421.11

PROJECT TITLE: Thermal Performance of Whole Buildings

KEYWORD: Thermal performance

Project Number:
4214136

Project Leader:
B. A. Peavy

Funding: $60.3 K
RTS

BACKGROUND: The main thrust of this project is to determine by analytical and experimental means the heat transfer and thermal behavior and response of the fabric of buildings, in order to improve the quality of the indoor environment with the minimum expenditure of energy for heating and cooling.

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: The first phase of the project is to develop mathematical solutions for determining the dynamic thermal performance of walls, roof, floors, and windows. The second phase is to investigate experimentally the thermal performance of inside-out building systems. The first phase is completed. The second phase, including the design, construction and measurement of a prototype structure in a high-bay environmental chamber was done. Analysis of test data is underway.

Persons to contact for further information:

B. A. Peavy
Room B118, Building 226
National Bureau of Standards
Department of Commerce
Washington, D. C. 20234
Phone 921-3503

RESULTS: An experiment was designed and a full-scale prototype building was constructed in a high-bay environmental chamber. A series of tests were completed with much data gathered on several parameters. Analysis and evaluation of results is underway.

Notes: Drafts of two papers were started and a report containing detailed data is planned.

TECHNICAL CAPABILITIES A high-bay environmental laboratory with temperature range from -50 to 135°F and relative humidity range from 15 to 85% capable of testing a building of one or two stories. A data acquisition system, without control features, capable of recording 300 channel analog transducer signals on punched cards.

421.11

PROJECT TITLE: Criteria for Refrigerated Enclosures

KEYWORD: Refrigerated enclosures

BACKGROUND: This project was funded for NBS support for a proposed effort to be cosponsored by NBS, USDA and TBEA. The latter organizations were unable to provide support and NBS effort in the project was terminated after 6 months with remaining funds reassigned to other projects.

RESEARCH EFFORT: The objective was to develop a simplified in-plant test method for determining the cooling load of refrigerated enclosures. The metering heat sink method apparatus was assembled and made ready for use to investigate this problem. The project was terminated at this point for lack of financial support.

RESULTS: A study was made and a proposed test procedure involving a reduction of indoor pressure by a small amount was prepared.

TECHNICAL CAPABILITIES Trained personnel and a rebuilt metering heat sink apparatus including instrumentation and data acquisition systems for use in an environmental chamber.

Project Number:
4214137

Project Leader:
C. W. Phillips

Funding: $15.4 K
RTS

Project Initiation Date:
July 1, 1969

Completion Target Date:
January 1, 1970

Persons to contact for further information:
C. W. Phillips
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3512

Notes: Simplified Laboratory Procedures for Simulating the Effect of Air Leakage into Refrigerated Enclosures, P. R. Achenbach, IIR Bulletin Annexe 1969-3.

421.11

PROJECT TITLE: Natural Convection Modeling of Underground Shelters

KEYWORD: Natural convection

Project Number:
4214441

Project Leader:
E. M. Barber

Funding: $36.8 K
(OA, DOD, OCD)

BACKGROUND: The Office of Civil Defense is concerned with the distribution of air due to natural ventilation, within survival shelters. Previous studies have been made of air distribution within shelters but these have met with little success due to the extreme difficulty of detecting the low velocity air streams.

Project Initiation Date:
July 1, 1969

Completion Target Date:
December 1970

RESEARCH EFFORT: A technique has been under development at NBS for the study of low velocity air motion in rooms. The objectives of the NBS program and the OCD needs were combined into a joint program to perfect the technique and to study air motion in single room shelters. This study was carried out by utilizing a scale model of a shelter. The approach was to study the parameters which produce dynamic similarity between the model and the full scale shelter. It was found that the use of high temperature water as the fluid in the model would produce results in the model which could then be used to predict air velocities and temperatures in the full scale case.

Persons to contact for further information:

E. M. Barber
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

RESULTS: The experimental technique was developed. Results obtained indicate that much can be learned from the study of convection in this manner. Generally the air in a shelter is quite stratified, the majority of the air motion occurs along the surfaces of the room.

Notes: A report on the work completed thus far was drafted.

TECHNICAL CAPABILITIES A hot water apparatus to obtain a modeling for the study of convection in single and multi-room configurations. Temperatures and convection patterns can be determined.

421.11

PROJECT TITLE: Thermal Performance - Navy Relocatable Building

KEYWORD: Thermal performance

BACKGROUND: The objective was to evaluate the air leakage and thermal performance of a prototype-relocatable building for the U. S. Navy.

RESEARCH EFFORT: The building was constructed in the high-bay environmental chamber and measurements were made on the rate of air leakage at selected pressure differences and of the thermal performance of the whole structure at isothermal conditions both with and without racking forces applied to simulate wind loading. Measurements of the gross heat loss and energy necessary to maintain the indoor temperature were made.

RESULTS: The building leaked air primarily at the doors, windows and panel joints. The test results were analyzed and a special analysis of heat transfer across aluminum extrusions was made. A report was prepared.

TECHNICAL CAPABILITIES A high-bay environmental chamber with control of temperature over the range -50 to 135°F and relative humidity from 15 to 85%.

Project Number:
4214442

Project Leader:
C. W. Phillips

Funding: $1.3 K
OA Navy

Project Initiation Date:
July 1, 1969

Completion Target Date:
continuing

Persons to contact for further information:
F. J. Powell
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3501

Notes: Results were drafted as an NBS report.

421.11

PROJECT TITLE: Heat Transfer from the Heated Underground Pipe

KEYWORD: Underground pipe heat transfer

Project Number:
4214443

Project Leader:
Dr. T. Kusuda

Funding: $12.1 K
(OA, DOD, Tri-Services)

BACKGROUND: Engineers of Tri-Services feel that existing heat transfer data from heated underground pipes are inadequate in that they fail to take advantage of the gradual increase of the thermal resistance due to the drying up of soil around the heated pipe. They are also interested in the corrosion protection of heated pipes.

Project Initiation Date:
July 1, 1969

Completion Target Date:
September 5, 1970

RESEARCH EFFORT: Evaluation of the transient heat transfer from the underground heated pipes must include the change of thermal characteristics of soil as the result of changes in temperature and moisture. Mathematical studies of the combined heat and water transfer around a pipe are extremely difficult. Effort is being made to obtain experimental data and develop semi-empirical formulas to predict the change of heat transfer caused by the changes in soil conditions.

Persons to contact for further information:
Dr. T. Kusuda
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

RESULTS: A computer program to account for the soil thermal property change for the pipe heat transfer problems is being developed. Design of experimental system to obtain in-situ the transient nature of a heated underground pipe has been completed.

Notes: Theoretical studies on underground pipe heat transfer is presented in NBS Report 10194 entitled "Heat Transfer Analysis of Underground Heat Distribution Systems."

TECHNICAL CAPABILITIES Underground instrument bunker being capable of acquiring hourly temperature and heat flow values of underground pipes. Various computer programs to analyze underground pipe heat transfer; experienced research personnel to handle heat flow measurements.

421.11

PROJECT TITLE: Heat Transfer for Underground Chilled Water Pipes

KEYWORD: Underground pipe heat transfer

BACKGROUND: Although the chilled water pipes are installed in underground without insulation in many parts of the U.S.A., there are needs for design guidance to determine under what conditions the insulation is required to reduce the heat gain. This study was requested by the General Services Administration to obtain basic information to establish such criteria.

RESEARCH EFFORT: The first year's effort was to obtain theoretical heat transfer values for insulated and non-insulated underground multiple pipe systems. The currently available procedure for underground pipe heat transfer is limited to a steady state heat conduction situation of a single pipe buried in a homogeneous soil. Effort was made to extend the calculation procedures for non-steady heat transfer of the multiple pipe systems where supply and return chilled water pipes are installed together in the vicinity of heated pipes.

RESULTS: Mathematical method to determine transient heat transfer characteristics of multiple underground pipe systems has been developed and sample calculations were obtained. Experimental program to measure the heat transfer of an existing underground chilled water pipe has started.

TECHNICAL CAPABILITIES Various computer programs to obtain heat transfer of multiple underground pipe systems; sophisticated data acquisition system; high mathematical skill to perform the theoretical calculations; experienced experimentalist to handle heat flow meters.

Project Number:
4214444

Project Leader:
Dr. T. Kusuda

Funding: $21.9 K
(GSA)

Project Initiation Date:
July 1, 1969

Completion Target Date:
Continuing

Persons to contact for further information:
Dr. T. Kusuda
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

Notes: Theoretical studies were presented in NBS Report 10194 entitled "Heat Transfer Analysis of Underground Heat Distribution Systems".

421.11

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Defects in Trailer-Type Housing - Kwajalein Atoll

KEYWORD: Trailer-type housing

Project Number:
4214445

Project Leader:
C. W. Phillips

Funding: $13.8 K
OA, DOD, Kwajalein

BACKGROUND: At the request of the U. S. Army Engineers District, Honolulu, an investigation on design, installation and/or material defects and deficiencies was performed on trailer-type housing on Kwajalein Atoll.

Project Initiation Date:
October 1969

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: The effort consisted of a study of pertinent documentation, a field investigation, and limited laboratory investigation. Specific subjects of concern were exterior doors, windows, air-conditioners, floor tile, electrical service users and door hardware.

Persons to contact for further information:

C. W. Phillips
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3512

RESULTS: The investigation was completed and a report written giving results and conclusions. Litigation is pending.

Notes: NBS Report 10263, Report on the Investigation of Certain Defects and Deficiencies in Trailer-Type Houses on Kwajalein Atoll

TECHNICAL CAPABILITIES Technical expertise backed by laboratory facilities plus experienced engineering personnel.

421.11

PROJECT TITLE: Delamination Sandwich Panel Structure (MUST)

KEYWORD: Delamination; honeycomb; solar heating

Project Number:
4214447

Project Leader:
T. W. Watson

Funding: $1.8 K
OA, DOD, Army

BACKGROUND: The Army has procured a large number of paper honeycomb panel structures which have exhibited delamination shortly after acceptance. This study was initiated in an effort to determine if solar heating of the exterior surfaces of the structures triggered the delamination.

Project Initiation Date:
June 10, 1970

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: Two MUST Ward Containers (one prototype and one production model) were subjected to 180° skin surface temperatures (representing solar heat) in an environmental chamber with an ambient temperature cycle of 70 to 100°F over a 24 hour span. The skin surface temperatures were held at about 180°F for 3 hours during the peak temperature of the daily chamber cycle while the interior air temperature of the containers was maintained at about 75°F.

Persons to contact for further information:

T. W. Watson
Room B104, Building 226
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234
Phone 921-3521

RESULTS: Minor delamination of the skin from the honeycomb occurred on the folding roof panel of both wards. No delamination was observed on the fixed roof of the prototype ward whereas extensive delamination occurred on the roof of the production sample. This delamination was progressive for each 24 hr cycle of a total of six simulated daily cycles to which the wards were subjected.

Notes: Report of test and findings is under preparation at this time for NLABS.

TECHNICAL CAPABILITIES A 49 by 42 ft 3-story high-bay environmental laboratory with a temperature range of -50 to 150°F with humidity control--can provide steady or variable climatic conditions simulating seasonal or diurnal weather exposures. An automatic data acquisition system is also available.

421.11

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Performance Characteristics of Plumbing Systems

KEYWORD: Plumbing systems; hydraulic performance

BACKGROUND: The Building Research Division provides continuing technical input to plumbing engineering criteria that are incorporated into plumbing codes and standards and into generally accepted practice. A continuing program is essential to keep in the forefront.

RESEARCH EFFORT: Attention was directed primarily to the design and acquisition of necessary research facilities, to the identification of needed research programs and opportunities for carrying out such programs, and to the furnishing of advice and consultation. Matching funds were provided for Project 4214360 for development of test procedures and foreign testing of a SOVENT single-stack system proposed for high-rise apartments.

RESULTS: Completed structural design and part of construction of new facility. Acquired several key elements of the data acquisition system and related transducers. Reported to NAHB on results of tests on reduced-size venting, and to IAPMO on the state of the art for venting in general. Developed several research proposals. Analysis of test results on a SOVENT single-stack system was in progress at the end of the fiscal year.

TECHNICAL CAPABILITIES: A 9' x 14' x 50' medium-rise bay for testing full-size 5- to 7-story plumbing systems, and a 9' x 50' x 23' low-rise bay for testing full-size 1- to 3-story systems; automatic high-speed data acquisition system capable of 64-256 channel operation, compatible with central computer for data processing; high-capacity, variable pressure hydraulic service systems.

Project Number: 4212135

Project Leader:
Robert S. Wyly

Funding: RTS $80.5 K

Project Initiation Date:
July 1, 1966

Completion Target Date:
Continuing

Persons to contact for further information:

Mr. P. R. Achenbach
Room B-114, Building 226
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Washington, D. C. 20234
Phone: 921-3637
- or-
Mr. Robert S. Wyly
Room A-303, Building 226
NBS
Washington, D. C. 20234
Phone: 921-2457

Notes: See NBS Report 10149; also TAPE Section, Building Systems Design, Mar, Jul, Aug 1969; "Bureau of Standards Role . . .," Contractor, Mar 15, 1970; and "Venting," The Official (IAPMO), Jan-Feb and Mar-Apr, 1970.

PROJECT TITLE: Performance Evaluation of SOVENT Plumbing System

KEYWORD: Plumbing system; hydraulic performance plumbing test

BACKGROUND: Fairfax County, Virginia requested recommendations from NBS as a condition to granting a code variance to permit installation of a SOVENT single-stack system in a high-rise apartment project. In order to make the requested recommendations, BRD required additional test data.

RESEARCH EFFORT: The BRD prescribed test procedures and monitored a new series of tests, utilizing the facilities of the Lehrwerkstatten der Stadt, Bern, Switzerland. (BRD facilities were not yet built). Hydraulic load tests were made on a 10-story system simulating the proposed installation in Fairfax County; tests were also made to determine interfixture effects within a single branch interval; and site visits and interviews with Swiss experts were conducted to identify certain criteria that could not be included in the test program. Matching RTS funds in the amount of $5 K (Project 4212135) were used to support this research effort in view of its broad national application.

RESULTS: Within the scope of the testing that was possible, the system satisfied tentative criteria. Trap-seal retention was considered adequate for various distributions of hydraulic load having total discharge rates equal to or exceeding anticipated maximum design discharge. Based in part on these results, the code variance was granted. The project illustrates one method by which innovative plumbing systems can be introduced into the U.S. construction process, and defined needs for research to develop adequate test procedures.

TECHNICAL CAPABILITIES: Although the tests were made in a Swiss laboratory, the experience served to improve the design of the BRD facility described in current project summary for Project 4212135. The Swiss laboratory provided for testing full-size 10-story stacks with a constant pressure recirculating water supply. Low-rise facilities were also available for one and two-story tests, as well as versatile special-purpose instrumentation for measuring discharge rates, water depths, and pressures.

Project Number: 4214360

Project Leader:

Robert S. Wyly

Funding: $ 5 K CDA
(Copper Development Assn.)

Project Initiation Date:
October 1969

Completion Target Date:

June 30, 1970

Persons to contact for further information:

P. R. Achenbach
Chief, Sensory Environment Branch
National Bureau of Standards
Washington, D. C. 20234
Phone: 301-921-3637
-or-
Robert S. Wyly
Building Transport Systems Section
Sensory Environment Branch
National Bureau of Standards
Washington, D. C. 20234
Phone: 301-921-2457

Notes:

421.13

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Truck Tire Noise Investigation

Project Number: 4080406

Project Leader:
William A. Leasure

KEYWORD: Noise; truck tires

Funding: $55,000

BACKGROUND: The project was established by the Department of Transportation to investigate the noise associated with various types of truck tires under a variety of conditions; e.g., pavement materials, truck speed and truck weight. The joint objective of DOT and NBS is to identify the physical parameters which affect the noise generation characteristics of truck tires and develop an information base.

Project Initiation Date:
May 1, 1970

Completion Target Date:
October 31, 1971

RESEARCH EFFORT: Test objectives were established and a test matrix was developed. Instrumentation needs were outlined and the necessary additional equipment was purchased. Several possible test sites were evaluated and one at Wallops Station was selected. Contacts were made with various trucking firms to establish the proper selection of test tires and trucks. The interfacing of the data acquisition system to a computer was investigated.

Persons to contact for further information:

William A. Leasure, Jr.
Applied Acoustics and Illumination Section
Room A-313, Building 226
NBS
Washington, D. C. 20234
Phone: 921-3395

RESULTS: The instrumentation was incorporated into a data acquisition system. The system was placed in a truck for mobility and arrangements were made to initiate the tests at Wallops. The acquisition of the selected tire types was accomplished. The necessary interface to the computer was ordered and computer programs to analyze the data were initiated.

Notes:

TECHNICAL CAPABILITIES: The mobile data acquisition system, the Mobile Acoustical Laboratory, and the NBS computer facilities will be used to collect, analyze and plot the relevant data.

421.14

PROJECT TITLE: Acoustical Grading for Automobile Tires

KEYWORD: Tire noise

BACKGROUND: National concern about noise pollution is increasing, and automobile tires contribute significantly to the overall level. If physical and subjective measures of tire sounds are consistent, an acoustical/auditory grading system for tires may be feasible. Acceptable limits for sounds could then be established.

RESEARCH EFFORT: Under contract with the Office of Noise Abatement of the Department of Transportation, a sample of 5 tires were studied under "typical" conditions, both in the laboratory and in the field. Physical measures and acceptability judgements were correlated in each instance and findings obtained in the two studies were compared.

RESULTS: Tire rankings for acceptability were consistent for all conditions in both studies. Physical (DBA scale) and subjective data were closely correlated in each investigation, although results in the laboratory were more clearcut than those of the field. Reports to the Department of Transportation covering both the laboratory and field studies are nearing completion.

TECHNICAL CAPABILITIES: Mobile acoustical laboratories exist with the capability to do tape recording, 1/3 octave band analysis, reverberation time measurements, and narrow band filtering. A 10' x 12' acoustically isolated room will be available in FY'71 for subjective studies in a controlled acoustical environment.

Project Number: 4080405

Project Leader:
Arthur I. Rubin

Funding: $50,000

Project Initiation Date:
August 19,1969

Completion Target Date:
August 31, 1970

Persons to contact for further information:

Dr. Arthur I. Rubin
Applied Acoustics and
Illumination Section
Room A-313, Building 226
NBS
Washington, D. C. 20234
Phone: 301-921-3515

Notes:

421.14

PROJECT TITLE: Building Acoustics

KEYWORD: Sound transmission; noise control; acoustic criteria; noise sources; subjective response

Project Number:
4212266

Project Leader:
D. R. Flynn

Funding: $50,000

BACKGROUND: The program involves investigation of (a) building acoustics parameters; e.g., sound transmission of wall partitions and floor/ceiling assemblies, flanking paths for noise in building systems, etc.; (b) impact noise problems in building and coordination of field and laboratory measurements of sound transmission through building walls, floors and ceilings.

RESEARCH EFFORT: Training of personnel in the operation of the NBS Mobile Acoustical Laboratory. Sound and vibration transmission in buildings using a cement block structure. Preparation of an audio-visual documentary presentation on noise pollution for Secretary of Commerce, Maurice Stans.

Project Initiation Date:
July 1966

Completion Target Date:
Continuing project

Persons to contact for further information:

Daniel R. Flynn
Applied Acoustics and
Illumination Section
Room A313, Building 226
National Bureau of Standards
Washington, D. C. 20234
Telephone: 301 921-3395

RESULTS: Personnel are familiar with the equipment in the mobile laboratory and the measurement capabilities thereof. The noise reduction properties of a cement structure with and without windows, and inside and outside thermal insulation have been analyzed. The sound demonstration was presented to various groups including the President's Science Advisory Committee, Department of Housing and Urban Development, etc.

Notes:

TECHNICAL CAPABILITIES Mobile Acoustical Laboratory and cement block structure in environmental chamber.

421.14

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Visual Environment

Project Number: 4214138

Project Leader:
John F. Halldane

KEYWORD: Vision; lighting; glare; visual impedance

Funding: $50,000

BACKGROUND: The project was first developed in the Psychophysics Section and was changed to "Visual Discomfort Criteria" because of the emphasis on glare problems. It has now been transferred to the Applied Acoustics and Illumination Section with the title "Illumination" to de-emphasize the psychophysical content.

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: A seminar on "Visual Discomfort Criteria" was conducted at NBS in September 1969. Various people in the field of glare were invited. Dr. Halldane presented the paper "Visual Responses of Travelers in Urban Environments" to the IEEE-GMMS ERS International Symposium in England. Dr. Howett attended the Bioengineering course at Berkeley, California, and has developed the background to embark on visual impedance and adaptation studies.

Persons to contact for further information:

Mr. Jack M. Fath
Applied Acoustics & Illumination Section
Room A-313, Building 226
National Bureau of Standards
Washington, D. C. 20234
Phone: 301-921-3395

RESULTS: The seminar changed the course of research from discomfort criteria to visual impedance studies, adaptation and acceptability criteria. In preparation for experiments a telephotometer, eyemovement monitor and 3 KW projector were purchased. A lighting frame has been assembled for adaptation studies.

Notes:

TECHNICAL CAPABILITIES: Vision laboratory: 18' x 18' lighting frame in a ceiling position; six 4-tube luminaires; eight 150W-incandescent dimming lamps; control box for independent switching. Gamma Scientific Precision Telephotometer; Eyemovement monitor; 3 KW projector with voltage regulator and screen.

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Thermal Discomfort Criteria

Project Number: 4214142

Project Leader:

John F. Halldane

KEYWORD: Thermal responses; thermal adaptation

Funding: $10,000

BACKGROUND: The project was first developed in the Psycoophysics Section and has now been transferred to the Environmental Engineering Section.

Project Initiation Date:
July 1, 1969

Completion Target Date:
June 30, 1970

RESEARCH EFFORT: A background in the area of thermal adaptation and thresholds for thermal acceptability has been developed. Dr. Halldane became a member of the ASHRAE committee on Physiology and Human Comfort, is writing a section on sensory perception for the Guide and has reviewed two technical papers. Dr. Givoni from Israel was consulted in the development of physiological studies.

Persons to contact for further information:

Mr. Frank J. Powell, Chief
Environmental Engineering Section
Room B-104, Building 226
National Bureau of Standards
Washington, D. C. 20234
Phone: 301-921-3501

RESULTS: It is important that further research identifies specific therman response criteria.

Notes:

TECHNICAL CAPABILITIES: Joint use of BRD environmental chambers.

421.14

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Noise Control in Buildings

KEYWORD: Noise control; noise abatement; heating; ventilating; air conditioning systems

Project Number:
4214434

Project Leader:
Jack M. Fath

Funding: $25,000

BACKGROUND: The initial objectives were to develop design, construction, evaluation and performance standards for the control of noise in buildings. These broad objectives have been redefined to center on the control of noise associated with heating, ventilating and air conditioning systems.

Project Initiation Date:
July 1968

Completion Target Date:
Continuing project

RESEARCH EFFORT: The general approach is to plan and execute studies and laboratory programs to develop information and techniques that will lead to the establishment of practical acoustical test methods and noise control standards. A comprehensive literature search was conducted to develop a background in, and become familiar with, the noise cources and noise control methods associated with heating, ventilating and air conditioning systems.

Persons to contact for further information:
Jack M. Fath
Applied Acoustics & Illumination Section
Room A313, Building 226
National Bureau of Standards
Washington, D. C. 20234
Phone 301-921-3395

RESULTS: An outline of the proposed report was submitted to the sponsors and it was mutually agreed that it incorporated the areas of immediate concern. The initial draft of the report was prepared and submitted to the sponsors for their comments prior to writing the final report.

Notes:

TECHNICAL CAPABILITIES The Mobile Acoustical Laboratory will be used for measuring and analyzing the noise generated by HVAC equipment.

421.14

BUILDING RESEARCH DIVISION
Project Summary, FY 1970

PROJECT TITLE: Advisory Services and Scientific Testing (HUD)

KEYWORD: Performance criteria; climatological data; codes

Project Number:
4213400

Project Leader:
Dr. J. R. Wright

Funding: $500,000 (OA)

BACKGROUND: The Building Research Division agreed to furnish the technical back-up for the testing and evaluation of "Operation BREAKTHROUGH" prototype housing for HUD, as well as other tasks that required the technical competence that NBS staff could provide.

Project Initiation Date:
January 1969

Completion Target Date:
January 1971

RESEARCH EFFORT: A document was written to establish the performance requirements and criteria to be used in the testing and evaluation of the BREAKTHROUGH prototype housing.

Site-related information was needed in the BREAKTHROUGH Program. The first task was the computation of climatological data for the eleven BREAKTHROUGH sites. Studies were made of the applicable codes and regulatory documents for each of the eleven sites. The processing of building permits at each of the eleven sites was studied and a report was written.

Persons to contact for further information:

Dr. E. O. Pfrang
Building 226, Room B266
National Bureau of Standards
U. S. Department of Commerce
Washington, D. C. 20234

RESULTS: Four volumes of guide criteria were submitted to HUD (NBS Report 10200). A climatological document was developed (NBS Report 10201). Eleven documents pertaining to codes and regulatory documents were issued (NBS Report 10202 through 10212). Eleven reports describing the process for obtaining building permits were issued (NBS Report 10302 through 10312).

Notes:

TECHNICAL CAPABILITIES A multidisciplined task group - consisting of architects, engineers and materials and codes specialists - was responsible for the technical input for the above reports.