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Industrial Hygiene Engineering Institute
Grant No. 1 A14 OH 00009
Final Report

Introduction

This report summarizes the purpose and results of a grant awarded by NIOSH to Texas A&M University for an Industrial Hygiene Institute scheduled for the Summer 1976. This grant was later extended to cover a second Institute in the Summer 1977. The purposes of both Institutes were to provide industrial hygiene training for selected college professors. Due to a large amount of unexpended funds after the first Institute, a second Institute in the Summer of 1977 was sought and approved. This report, then summarizes the purposes of both summer programs.

Purposes of the Summer Institute - 1976

This Summer Institute, held from July 9 to August 31, 1976 was developed for the purpose of providing college professors (attendees) a theoretical and practical base for the development of industrial hygiene engineering coursework at their own institution. The premises were that:

(1) Attendees should be able to acquire laboratory and field type experience with specific application to the development of a course in industrial hygiene engineering and control for use at their institution.

(2) The curricula and/or courses to be developed by the attendees will be enriched by exposure to practicing professionals and supplemented with field experiences where actual exposures exist in an industrial environment along with recognition, evaluation, and control measures implemented to deal with these exposures.

(3) The attendees will be encouraged to supply [a] engineering concepts as a design control, and [b] analysis concepts to a control design after installation.

(4) Instruction of sufficient depth and expertise can be provided by a combined team of qualified educators and practitioners selected from the Texas A&M faculty, NIOSH training faculty [if available], and industry.

Results of the Summer Institute - 1976

The list of attendees at the 1976 Institute and their affiliation is Attachment I of this report. The thirteen (13) attendees were unique in variety of geographical locations, background, academic preparation, academic level and interest to create an exceptionally stimulating intellectual environment. Each attendee offered specialized qualifications which were useful in developing the course "product", or final output.

The product of this course consisted of a set of instructor guides for a comprehensive course in industrial hygiene engineering. These guides followed the topical outline for the course (see Attachment II). Attendees gathered input from lectures, course reading materials and literature research. The final completion of these guides were assembled into a course notebook which has been provided to each attendee and transmitted to the NIOSH Division of Training and Manpower Development in Cincinnati, Ohio where it has been used as a resource document for the development of curriculum materials.

Purposes of the Summer Institute - 1977

The second Summer Institute was substantially different from the first since attendees were expected to teach materials which had been previously developed. In this case, the Institute was the test environment for a new course under development for NIOSH for integration into its training program. The new course entitled "Industrial Hygiene Engineering" is intended to replace a course currently offered by NIOSH of the same title

(Course 551). The new course, however, will be a totally integrated program of lecture outlines, problem sets, laboratory exercises, and visual aids appropriate to a three week (full time, seven hours per day) program. The attendees at the Summer Institute were expected to participate in presentations of the course materials. It was assumed that a minimum of preparation would be required since the provided lecture materials were in a reasonably complete, finished form. Each attendee selected to make a presentation was provided adequate lead time to research and polish materials he was assigned to present. The topical outline and assignments are shown in Attachment III.

At several points in the Institute program, guest speakers were invited to make presentations in specialized areas. These speakers were selected from industry and government as well as the faculty of Texas A&M University. Also, one field trip to a local Texas industry was arranged to acquaint attendees with realistic illustrations of industrial hygiene engineering problems.

The twelve (12) attendees at the second (1977) Summer Institute were similarly unique in variety and background to those in the first Institute. A list of attendees and their affiliation is shown in Attachment IV of this report. Each attendee was chosen to attain the most benefit possible from the material presented as well as their potential for contributing to the purposes of the Institute.

Results of the Summer Institute -1977

The second Institute differed from the first in its purpose and the form of end product. In this Institute, attendees were assigned topical areas in the NIOSH "Industrial Hygiene Engineering Course" as developed by Management Resource Associates (MRA) under contract. This course consisted of a comprehensive package of instructor and student guides designed for immediate use. During this Institute each attendee performed as an instructor in test-teaching certain materials while the remaining attendees reviewed student materials and critiqued the lectures. Two representatives of the contractor (Management Resource Associates) were in attendance

at all times and recorded verbal comments and suggested changes to the materials. In certain cases, written comments and suggested modifications were submitted to the contractor.

Value of Institutes to Attendees and to NIOSH

The Institutes were judged a success by attendees and staff. In the first Institute a valuable product was developed which has been useful in preparation of teaching materials both by NIOSH and attendees at their individual institutions. More importantly, a group of university faculty have been indoctrinated in industrial hygiene engineering principles which they in turn will present to their students.

The second institute offered similar benefits in that faculty were oriented in industrial hygiene engineering. Beyond this, however, NIOSH gained a valuable comprehensive review of a draft course package. The review which was provided represented a suitable field test of materials before a highly critical audience. NIOSH representatives as well as the contractor commented on the value of the review in developing a significantly improved final product.

Publications

No publications have resulted from either of the Institutes although a copy of the course notebook developed as a result of the 1976 Institute was transmitted to the NIOSH Division of Training and Manpower Development for their utilization.

Exhibit I

Attendees

Industrial Hygiene Engineering Institute

July 12 - 30, 1976

Allen, Robert W.	Ferris State College Industrial Department Big Rapids, MI 49307
Anderson, Lloyd A.	Industrial Engineering Department North Dakota State University University Station Fargo, ND 58102
Bautz, Anton F.	College of Industrial Management Clemson University Clemson, SC 29631
Campbell, John C.	Industrial and General Engineering Oregon State University Corvallis, OR 97331
Dunham, Dennis	Occupational Safety & Health Technology Dept. San Jacinto College Pasadena, TX 77505
Faison, James H., Jr.	Cape Fear Technical Institute 411 Front Street Wilmington, NC 28401
Hailes, Charles W.	Engineering Technology Department Utah State University Logan, UT 84321
Hale, Paul N., Jr.	Industrial Engineering Department Louisiana Tech University Ruston, LA 71270
Hooker, Regine C.	Technology Building Westchester Community College 75 Grasslands Road Valhalla, NY 10595
Kromp, Carl M.	Industrial Engineering Department University of Miami Coral Gables, FL 33124
Lee, Diana Y.	Westchester Community College 75 Grasslands Road Valhalla, NY 10595
Smaltz, Jacob J.	Industrial Engineering Department Kansas State University Manhattan, KS 66502
Wallace, Lon J.	Industrial Education Brigham Young University Provo, UT 84601

EXHIBIT II

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Training and Manpower Development
Texas A&M University
College Station, Texas

INDUSTRIAL HYGIENE ENGINEERING (551)

July 12 - 30, 1976

AGENDA FOR FIRST WEEK

Course Location: Texas A&M University
College Station, Texas

Course Director: Dr. Ralph J. Verno
(713) 845-5531

Monday 7-12-76	Tuesday 7-13-76	Wednesday 7-14-76	Thursday 7-15-76	Friday 7-16-76
8:00 - 9:00 Overview of OSHA Gilmore	8:00 - 9:00 HW Review Gilmore	8:00 - 9:00 HW Review Clapp	8:00 - 9:00 HW Review Konzen	8:00 - 9:00 HW Review Clapp
9:00 - 10:00 OSHA - Industrial Guest	9:00 - 10:00 Physiology Fife	9:00 - 10:00 Gases/Vapors Clapp	9:00 - 10:00 Ionizing Smathers	9:00 - 10:00 Ergonomics - Man/Machine Ellis
10:00 - 11:00 Hygienists View Guest	10:00 - 11:00 Physiology Fife	10:00 - 11:00 Air Sampling Instruments Konzen	10:00 - 11:00 Ionizing Smathers	10:00 - 11:00 Ergonomics - Fatigue Ellis
11:00 - 12:00 Inorganic Chemistry Gilmore	11:00 - 12:00 Physiology Fife	11:00 - 12:00 Instrument Calibration Clapp	11:00 - 12:00 Chemical Calibration McKinley	11:00 - 12:00 NIOSH - Recent Changes Pettigrew
12:00 - 1:00		L U N C H		
1:00 - 2:00 Organic Chemistry Gilmore	1:00 - 2:00 Dose Response Konzen	1:00 - 2:00 LAB Konzen	1:00 - 2:00 LAB McKinley	1:00 - 2:00 NIOSH - Changes Pettigrew
2:00 - 3:00 Dermatoses Key	2:00 - 3:00 TLV's Konzen	2:00 - 3:00 Air Flow Instruments Konzen	2:00 - 3:00 Chemical McKinley	2:00 - 3:00 Heat Stress Clapp
3:00 - 4:00 Dermatoses Key	3:00 - 4:00 Toxicology White	3:00 - 4:00 Calibration Konzen	3:00 - 4:00 Calibration McKinley	3:00 - 4:00 DEMO Clapp
4:00 - 5:00 NIOSH Insights Key	4:00 - 5:00 Toxicology White	4:00 - 5:00 Calibration Konzen	4:00 - 5:00 Calibration McKinley	4:00 - 5:00 DEMO Clapp
Assign: Chemistry	Assign: Gas/Vapor	Assign: Calibra-	Assign: Chemical	Assign: Heat

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Division of Training and Manpower Development
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College Station, Texas

INDUSTRIAL HYGIENE ENGINEERING (551)

July 12 - 30, 1976

AGENDA FOR SECOND WEEK

Course Location: Texas A&M University
College Station, Texas

Course Director: Dr. Ralph J. Vernon
(713) 845-5531

Monday 7-19-76	Tuesday 7-20-76	Wednesday 7-21-76	Thursday 7-22-76	Friday 7-23-76
8:00 - 9:00 HW Review Clapp	8:00 - 9:00 HW Review Gilmore	8:00 - 9:00 HW Review Clapp	8:00 - 9:00 HW Review Clapp	8:00 - 9:00 Field
9:00 - 10:00 Loss Control Programs Vernon	9:00 - 10:00 Noise Effects on Man Clapp	9:00 - 10:00 Prin. of Eng. Controls Clapp	9:00 - 10:00 Non-Ionizing Rad. Illum. Vernon	9:00 - 10:00 Trip
10:00 - 11:00 Loss Control Programs Vernon	10:00 - 11:00 Physics of Sound	10:00 - 11:00 Engineering Control Clapp	10:00 - 11:00 Non-Ionizing Rad. Illum. Vernon	10:00 - 11:00 To
11:00 - 12:00 Loss Control Vernon	11:00 - 12:00 Noise Criteria Clapp	11:00 - 12:00 Eng. Control Methods Clapp	11:00 - 12:00 Non-Ionizing Rad. Illum. Vernon	11:00 - 12:00 Monsanto
12:00 - 1:00		L U N C H		
1:00 - 2:00 System Safety Applied to IH Gilmore	1:00 - 2:00 LAB Clapp	1:00 - 2:00 Fundamentals of of Vibration Crenwelge	1:00 - 2:00 IH Program Priorities Atwood	1:00 - 2:00 Company
2:00 - 3:00 System Safety Applied to IH Gilmore	2:00 - 3:00 Noise Measurement and Calibration Clapp	2:00 - 3:00 Fundamentals of Vibration Crenwelge	2:00 - 3:00 IH Program Priorities Atwood	2:00 - 3:00 Texas
3:00 - 4:00 System Safety Applied to IH Gilmore	3:00 - 4:00 Noise Measurement and Calibration Clapp	3:00 - 4:00 LAB Clapp	3:00 - 4:00 Orientation for Field Trip Gilmore	3:00 - 4:00 City
:00 - 5:00	4:00 - 5:00	4:00 - 5:00 Eng. Controls Clapp	4:00 - 5:00 Orientation Gilmore	4:00 - 5:00 Texas
ign: System afety	Assign: Noise	Assign: Noise		

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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Training and Manpower Development
Texas A&M University
College Station, Texas

INDUSTRIAL HYGIENE ENGINEERING (551) July 12 - 30, 1976

AGENDA FOR THIRD WEEK

Course Location: Texas A&M University
College Station, Texas

Course Director: Dr. Ralph J. Verno
(713) 845-5531

Monday 7-26-76	Tuesday 7-27-76	Wednesday 7-28-76	Thursday 7-29-76	Friday 7-30-76
8:00 - 9:00 HW Review Vernon	8:00 - 9:00 HW Review Konzen	8:00 - 9:00 HW Review Clapp	8:00 - 9:00 HW Review Duncan	8:00 - 9:00 HW Review Konzen
9:00 - 10:00 Review Field Trip Gilmore	9:00 - 10:00 Principles of Ventilation R.F. Clapp	9:00 - 10:00 System Pressures Duncan	9:00 - 10:00 Equivalent Length Method Konzen	9:00 - 10:00 Personal Protective Equipment Hanson
10:00 - 11:00 Pneumoconioses Konzen	10:00 - 11:00 Principles of Ventilation R.F. Clapp	10:00 - 11:00 LAB Duncan	10:00 - 11:00 Equivalent Length Method Konzen	10:00 - 11:00 Personal Protective Equipment Hanson
11:00 - 12:00 Dust Evaluation Konzen	11:00 - 12:00 Dilution Ventilation R.F. Clapp	11:00 - 12:00 Ventilation Measurement Duncan	11:00 - 12:00 Equivalent Length Method Konzen	11:00 - 12:00 Personal Protective Equipment Hanson
12:00 - 1:00		L U N C H		
1:00 - 2:00 LAB Konzen	1:00 - 2:00 Principles of Design R.F. Clapp	1:00 - 2:00 Air Cleaning Devices Bartos	1:00 - 2:00 Equivalent Length Method Konzen	1:00 - 2:00 EXAM
2:00 - 3:00 Dust Konzen	2:00 - 3:00 Evaluation of Hood Design R.F. Clapp	2:00 - 3:00 Fans Bartos	2:00 - 3:00 LAB	2:00 - 3:00 Critique/ Evaluation
3:00 - 4:00 Evaluation Konzen	3:00 - 4:00 Hood Design Calculations R.F. Clapp	3:00 - 4:00 Fan Selection Bartos	3:00 - 4:00 Ventilation Design	3:00 - 4:00
Assign: Dust Evaluation	Assign: Hood Design	Assign: System Pressures	Assign: Ventilation Design	

EXHIBIT III
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Training and Manpower Development
Texas A&M University
College Station, Texas

INDUSTRIAL ENGINEERING (551)

July 1977

AGENDA FOR FIRST WEEK

Course Location: Texas A&M University
College Station, Texas

Course Director: Dr. D. E. Clapp
(713) 845-5531

Monday 7-11-77	Tuesday 7-12-77	Wednesday 7-13-77	Thursday 7-14-77	Friday 7-15-77
8:00 - 9:00 Orientation Greeting	8:00 - 9:00 Review Homework	8:00 - 9:00 Review Homework	8:00 - 9:00 Review Homework	8:00 - 9:00 Review Homework
9:00 - 10:00 Bruce Byers Management Resource Associates	9:00 - 10:00 *NIOSH Programs George Pittigrew (Dallas)	9:00 - 10:00 1.3.1 Control of Exposures (Brem)	9:00 - 10:00 2.3.1 Natural & Dilution Ventilation (Linville)	9:00 - 10:00 2.4 LC Characteristics of Hoods (Schaal)
10:00 - 11:00 *OSHA Issues and Considerations (Gilmore)	10:00 - 11:00 *	10:00 - 11:00 2.1.1 Characteristics of Air (Ferris)	10:00 - 11:00 2.3.2 Local Exhaust Ventilation (Linville)	10:00 - 11:00 2.4.2 Principles of Air Cleaning (Hooker)
11:00 - 12:00 *	11:00 - 12:00 *	11:00 - 12:00 2.1.2 Properties of Airborne Contaminants (Ferris)	11:00 - 12:00 2.3.3 Make Up Air (Linville)	11:00 - 12:00 Principles of Air Cleaning (Hooker)
12:00 - 1:00		L U N C H		
1:00 - 2:00 1.1.1 Recognition of Health Hazards (Brem)	1:00 - 2:00 1.2.1 Human Systems (Hitt)	1:00 - 2:00 2.2.1 Principles of Air Movement (Ogle)	1:00 - 2:00 2.3.4 Review of Principles of Ventilation (Ferris)	1:00 - 2:00 2.4.3 Air Cleaning Devices (Hooker)
2:00 - 3:00 1.1.2 Methods of Measuring and Evaluating Health Hazards (Brem)	2:00 - 3:00 1.2.2 Industrial Toxicology (Hitt)	2:00 - 3:00 Principles of Air Movement (Ogle)	2:00 - 3:00 2.4.1 Design of Exhaust Hoods (Schaal)	2:00 - 3:00 2.4.4 Air Moving Devices (Quigley)
3:00 - 4:00 Discussion	3:00 - 4:00 1.2.3 Physical Hazards (Hitt)	3:00 - 4:00 2.2 LC Learning Center Air Movement (Ogle)	3:00 - 4:00 2.4.1 Design of Exhaust Hoods (Schaal)	3:00 - 4:00 2.4.4 Air Moving Devices (Quigley)

*Outside Speaker

EXHIBIT III
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Training and Manpower Development
Texas A&M University
College Station, Texas

INDUSTRIAL ENGINEERING (551)

July 1977

AGENDA FOR SECOND WEEK

Course Location: Texas A&M University
College Station, Texas

Course Director: Dr. D. E. Clapp
(713) 845-5531

Monday 7-18-77	Tuesday 7-19-77	Wednesday 7-20-77	Thursday 7-21-77	Friday 7-22-77
8:00 - 9:00 Review Homework	8:00 - 9:00 Review Homework	8:00 - 9:00 Review Homework	8:00 - 9:00 Review Homework	8:00 - 9:00 Field Trip
9:00 - 10:00 2.4.5 Design of Ducts (Schaal)	9:00 - 10:00 2.5.3 System Design (Ogle)	9:00 - 10:00 2.7.2 Environmental Air Pollution (Parker)	9:00 - 10:00 3.2.1 Methods for Controlling Thermal Hazards (Burgess)	9:00 - 10:00 DIAMOND SHAMROCK HOUSTON TEXAS
10:00 - 11:00 Design of Ducts (Schaal)	10:00 - 11:00 2.6.1 Recirculation of Exhaust Air (Ogle)	10:00 - 11:00 2.7.3 Ventilation Review Operation Standards (Parker)	10:00 - 11:00 4.1.1 Physics of Sound (Lao)	10:00 - 11:00
11:00 - 12:00 2.5.1 Principles of System Design (Parker)	11:00 - 12:00 2.6.2 Non Standard Conditions (Ogle)	11:00 - 12:00 3.1.1 Heat Exchange and Its Effects (Burgess)	11:00 - 12:00 4.1.2 Physics of Sound (Lao)	11:00 - 12:00
12:00 - 1:00		LUNCH		
1:00 - 2:00 2.5.1 Principles of System Design (Parker)	1:00 - 2:00 2.6.3. Thermal Ventilation Effects (Quigley)	1:00 - 2:00 3.1.2 Thermal Measurement (Burgess)	1:00 - 2:00 4.1.3 Physics of Sound (Lao)	1:00 - 2:00
2:00 - 3:00 2.5.2 Design Session (Parker)	2:00 - 3:00 2.7.1 Testing Procedures in the Plant (Quigley)	2:00 - 3:00 3.1.3 Thermal Stress Indices (Burgess)	2:00 - 3:00 *Industrial Hygiene Programs at Shell Oil (Atwood)*	2:00 - 3:00
3:00 - 4:00 Design Session (Parker)	3:00 - 4:00 2.7 LC Testing Ventilation Systems (Quigley)	3:00 - 4:00 Other Thermal Indices Duncan*	3:00 - 4:00 *Industrial Hygiene Programs at Shell Oil (Atwood)*	3:00 - 4:00

*Outside Speaker

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INDUSTRIAL ENGINEERING (551)

July 1977

AGENDA FOR THIRD WEEK

Course Location: Texas A&M University
College Station, Texas

Course Director: Dr. D. E. Clapp
(713) 845-5531

Monday 7-25-77	Tuesday 7-26-77	Wednesday 7-27-77	Thursday 7-28-77	Friday 7-29-77
8:00 - 9:00 Field Trip Review (Gilmore)	8:00 - 9:00 5.1.3 Industrial Illumination (Hooker)	8:00 - 9:00 6.2.4 Control of Ionizing Radiation (Ferris)	8:00 - 9:00 8.1.1 Industrial Water Quality (Linville)	8:00 - 9:00 8.3.2 Basic Economic Analysis (Brem)
9:00 - 10:00 4.2.1 The Ear and Effects of Sound (Ferris)	9:00 - 10:00 6.1.1 Non Ionizing Radiation Chemistry/Physics (Quigley)	9:00 - 10:00 7.1.1 Ergonomics Introduction (Aurioles)	9:00 - 10:00 8.1.2 Control of Solid Waste (Schaal)	9:00 - 10:00 8.3.4 Legal Aspects of Industrial Hygiene (Brem)
10:00 - 11:00 4.3.1 Vibration (Lao)	10:00 - 11:00 6.1.2 Applications and Related Hazards (Quigley)	10:00 - 11:00 7.1.2 Identification of Ergonomics Exposures (Aurioles)	10:00 - 11:00 8.2.1 Purchase, Handling Storage of Hazard-ous Materials (Quigley)	10:00 - 11:00 Personal Protective Equipment (Hanson)*
11:00 - 12:00 4.4.1 Noise Control (Lao)	11:00 - 12:00 6.1.3 Control of Non Ionizing Radiation (Burgess)	11:00 - 12:00 7.2.1 Man as a Physical Component (Aurioles)	11:00 - 12:00 8.2.2 Personal Protection Equipment (Brem)	11:00 - 12:00 Personal Protective Equipment (Hanson)*
12:00 - 1:00		L U N C H		
1:00 - 2:00 4.4.2 Noise Control (Lao)	1:00 - 2:00 6.2.1 Ionizing Radiation Chemistry/Physics (Hitt)	1:00 - 2:00 7.2.2 Man as a Control-ling Component (Aurioles)	1:00 - 2:00 8.3.1 Cost of Indus-trial Hygiene Control (Goltra)	1:00 - 2:00 Critique/Evaluation
2:00 - 3:00 5.1.1 Industrial Illumination (Hooker)	2:00 - 3:00 6.2.2 Application & Related Hazards (Hitt)	2:00 - 3:00 7.3.1 Design of the Job (Aurioles)	2:00 - 3:00 Cost of Indus-trial Hygiene Control (Goltra)	2:00 - 3:00 Critique/Evaluation
3:00 - 4:00 5.1.2 Industrial Illumination (Hooker)	3:00 - 4:00 6.2.3 Monitoring Instrumentation (Hitt)	3:00 - 4:00 7.3.2 Design of the Workplace (Aurioles)	3:00 - 4:00 Cost of Indus-trial Hygiene Control (Goltra)	3:00 - 4:00

*Outside Speaker

Exhibit IV

Attendees

Industrial Hygiene Engineering Institute

July 8 - 29, 1977

Aurioles, Gabriel G.	Florida International University Tamiami Trail Miami, FL 33199
Burgess, George M.	Northern Virginia Community College Alexandria Campus Alexandria, VA 22311
Brem, Eugene S.	Cogswell College 600 Stockton Street San Francisco, CA 94108
Ferris, Robert J.	Housatonic Community College 510 Barnum Avenue Bridgeport, CT 06608
Hitt, George G.	Division of Engineering Technology Memphis State University Memphis, TN 38152
Hooker, Regine C.	Westchester Community College 75 Grasslands Road Valhalla, NY 10595
Lao, Y. J.	Department of Environmental Health East Carolina University Greenville, NC 28734
McGilberry, Joe H., Sr.	Tennessee Tech University Box 5011 Cookeville, TN 38501
Ogle, Randall Brian	Rowan Technical Institute Kulmac Road Salisbury, NC 28144
Parker, Robert D. R.	Department of Biology, UMC 55 Utah State University Logan, UT 84322
Quigley, John Thomas	University of Wisconsin 423 North Lake Street Madison, WI 53706
Shaal, Ivan E.	Arizona State University Tempe, AZ 85281