

V. SURVEYOR TRAINING

The process of recruiting personnel for the NOES and developing an appropriate training program began with an in-house examination of the personnel requirements and training program utilized in the 1972-1974 NOHS.

Examination of the first NOHS publication (Volume I), survey correspondence, and interviews with persons involved in the NOHS effort revealed several factors that warranted consideration in the recruitment and training of NOES field personnel:

1. All the NOHS surveyors were bachelor degree engineers with little or no industrial or occupational health experience.
2. The training program for the NOHS surveyors was a nine-week course of instruction in industrial hygiene which included coursework in safety, toxicology, and sampling. The training was provided by a university under a contract issued by NIOSH.
3. That portion of the NOHS training program devoted specifically to survey procedures, data encoding protocol, and interview techniques amounted to three days of formal instruction followed by on-the-job training during the field phase of the training regimen.
4. The first portion of field training for the NOHS lasted four weeks, and consisted of individual surveyors accompanying state regulatory personnel on their inspections, while completing NOHS forms. This was followed by a two-week tour of duty in a single city where survey results were compared, and differences in observations and interpretations were resolved among the surveyor group by general consensus with input from survey Headquarters.
5. Following the field training phase, NOHS surveyors were assigned in pairs to each of the Federal regions, and operated under regional control for the duration of the survey.

In considering these points, the NOES staff made several basic decisions:

1. The NOES, like the NOHS before it, would require field personnel with an adequate background in chemistry, physics, and mathematics. It was decided that persons with a Bachelor of Science degree would fulfill these requirements, and that to limit recruiting to engineers was unnecessarily restrictive.
2. While industrial hygiene training for the surveyors was necessary to provide a general understanding of occupational health, it was not necessary, given the observational techniques employed in the survey, to attempt to create fully qualified industrial hygienists for field work. Additionally, it was felt that the training program should be specifically tailored to the needs of the

survey, and should include extensive instruction designed to acquaint surveyors with actual industrial settings to improve surveyor recognition of potential exposure agents during the survey.

3. Quality control of incoming survey data was essential. Therefore, the coding protocol for survey observations should be very specific and the guidelines for survey activities should be rigidly controlled. This necessitated extensive training in survey interpretations, interview techniques, and coding formats.
4. The field training of NOES surveyors should be accomplished on an individual basis by industrial hygienists trained in the NOES procedures and/or by experienced NOES surveyors with emphasis on uniformity in identifying and recording observations of potential exposures to chemical, physical, or biological agents.
5. The NOES surveyors should operate in teams of from 3-10 people depending on survey needs with each team under the direct control of a designated team leader who would report to survey Headquarters. This organizational structure was felt to result in better control of survey activity, and to facilitate communications between the field and survey Headquarters.

On the basis of these decisions, the classroom and field training of the NOES surveyors was implemented as detailed in the following text.

The NOES surveyor training program was divided into five major sections with a total duration of nine calendar weeks. The major sections were as follows:

1. Industrial Hygiene
2. Industrial Processes
3. Recognition of Chemical, Physical, and Biological Agents
4. Interviewing and Data Encoding Procedures
5. Field Training

Training manuals composed of lecture notes and supplementary reference material for Sections 1 through 4 were developed for the training programs. Sections 1 through 3 lectures were videotaped to facilitate the training of successive surveyor groups.

Section 4 was taught in an interactive lecture mode, and the field training (Section 5) was conducted and supervised by experienced survey team leaders.

A. The Industrial Hygiene Section

The Industrial Hygiene Section of the NOES surveyor training program consisted of 24 hours of classroom instruction presented

in 19 separate lectures ranging from 30 minutes to 5 hours in length. Required reading from pre-printed reference material and lecture notes was estimated to take an average of 6 hours.

This training section was designed to provide the NOES surveyors with background knowledge on occupational health, and a familiarity with the various professional disciplines and working procedures utilized by the industrial hygiene community. Finally, the surveyors were provided with detailed instruction on the legal basis of the survey effort, including general enabling legislation and specific regulations governing the conduct of NIOSH field researchers. The list of lecture topics presented during this portion of the training program is as follows:

1. Role of the Industrial Hygienist
2. Industrial Toxicology
3. Hazardous Gases and Vapors
4. Absorption of Toxic Compounds
5. Hazardous Particulates
6. Industrial Ventilation
7. Noise and Vibration
8. Noise and Vibration Control
9. Industrial Radiation and Control
10. General Mechanical and Electrical Hazards
11. Fire Protection
12. Construction Site
13. Environmental Sampling Methods
14. Use of the Walk-Through Survey Technique
15. Private Industry Walk-Through Survey Procedures
16. General NIOSH Use of the Walk-Through Survey
17. Survey Procedure
18. NOES Walk-Through Survey Procedure (Introduction)
19. Legal Basis of the NOES Survey

B. The Industrial Processes Section

The Industrial Processes section of the NOES surveyor training consisted of 21 hours of classroom instruction presented in 15 separate lectures ranging from 1/2 to 4 hours in length. Required reading of reference material, lecture notes and text books was estimated to take an average of 8 hours.

This section provided the NOES surveyors with a detailed description of the manufacturing processes associated with selected industry categories, and the chemical agents used in each as an aid to their identification during the survey. Since chemical nomenclature plays a critical part in both this instruction segment and in the survey itself, this segment began with an intensive review of chemical nomenclature. The list of lecture topics presented during this section of the training program is as follows:

1. Chemical Nomenclature Review
2. Materials Transport and Storage
3. Heat Generators - Boilers, Incinerators

4. Solid Size Reduction and Enlargement
5. Gas-Solid Reduction
6. Pulp and Paper Production
7. Iron and Steel Production
8. Welding and Cutting Operations
9. Iron Ore Conversion
10. Aluminum Production
11. Automotive Production
12. Selected Petrochemical Processes
13. Glass Production
14. Utility Industry
15. Asphalt Batching

C. Recognition of Chemical, Physical, and Biological Agents

The third section of the NOES surveyor training consisted of 33 hours of classroom instruction presented in 20 separate lectures ranging from 1 to 3 hours in length. Pre-printed reference materials and lecture notes related to this section of the surveyor training required an estimated 3 hours of reading time.

This section provided a comprehensive overview of material usage and physical conditions in various industry types, as well as specialized lectures on control of occupational exposures. The list of lecture topics for this section is as follows:

1. Foundry Operations
2. Smelting Operations
3. Agrichemical Manufacture
4. Tire Manufacture
5. Welding
6. Industrial Radiation
7. Vapor Degreasing
8. Electroplating
9. Spray Painting
10. Insulation Material Production
11. Construction Safety
12. Cotton Processing
13. Confined Spaces
14. Refinery Operations
15. Chemical Production
16. Cement Production
17. Flammable and Explosive materials
18. Coke Production
19. Plastics Production
20. Industrial Use of Respirators

D. Survey Interview and Data Encoding Procedures

The final classroom section of the NOES surveyor training consisted of 15 days of lectures, group discussion, and survey-based practical exercises. In addition, examinations were given to assure the training staff that material from preceding Sections 1 through 3 had been learned.

This section provided formal training in the application of previous instruction to the conduct of survey interview, observation and data encoding procedures. At the completion of this section, students were prepared to assume field duties, subject to final on-the-job training and supervision by experienced industrial hygienists and/or designated team leaders.

Instruction was divided into three major segments, as discussed in the following text.

1. Part I - Survey Form Interview Procedures

Training in the administration of the Part I Survey Form (Management Interview) involved approximately 22 hours of classroom lecture and group discussion, as well as 16 hours of student-conducted interviews and related discussion with the training staff.

Part I Interview training was initiated with a three-hour lecture and discussion of the formal techniques of survey instrument (questionnaire) administration including such topics as probing techniques, interpretation of responses, handling of sensitive questions, personal deportment, and interview initiation (telephone and personal appearance). After this instruction, lecture and discussion on the expanded Part I Survey Form (including question, intent, inclusions, exclusions, and procedure) began. Thorough introduction and discussion of the Part I Survey Form with the candidate surveyors was allotted eight hours of classroom time. At the conclusion of this phase, the surveyors (as a group) conducted several simulated interviews with the instructor for an additional four hours to reinforce previous instruction. Each candidate surveyor was required to conduct eight full-scale management interviews with members of the NIOSH Hazard Section staff. The responses during the interview were based on pre-written scenarios to assure uniformity of management interview data across the surveyor class, and to enable the instructors to analyze the student's performance. Following each interview, the instructor and student analyzed and critiqued the interview.

This simulated interview process required two full days of student and instructor time. At the conclusion of the interview sequence, a review and class critique was conducted and an examination administered. Any student problems in technique or interpretation were corrected at this time.

The entire Part I training process required approximately five working days.

2. Part II - Survey Form Data Encoding Procedures

At the conclusion of the Part I training, introductory lectures on Part II procedures were initiated with lectures and discussions of survey protocols, general guidelines,

interpretations, and industrial hygiene considerations. This lecture series required 8-10 hours of classroom time. Printed reference material was provided.

Formal presentation of the Part II data encoding protocols began with an overview of the coding format as discussed in Section VII of this publication. At appropriate points, specific lectures were given regarding special topics included as technical appendices (i.e., Intended Controls, Physical Exposures, Product Use Term (PUT) list, Chronic Trauma, Use of Mnemonics, Welding Protocol). Review of presented material including class discussion and/or questions were conducted twice during this five-day portion of the instruction. The final two hours of this week of instruction was devoted to a written examination covering all material presented during the Part II instruction period. The third and final week of this section of training began with a review and discussion of the last test administered. During the four hours devoted to this exercise, any errors in student understanding were discussed and corrected by the instructor.

The final phase of the Part II instruction was conducted utilizing the "case study" approach exemplified in Section VII. Nineteen simulated industrial situations in written form (derived from actual NIOSH studies) were presented to the surveyor class in increasing degrees of complexity. Each student was required to properly encode each case study to the satisfaction of the instructor, before progressing to the next.

As each study was completed, it was thoroughly discussed by the instructor, and student errors noted and corrected. Following completion of all written case studies, actual field conditions were simulated through oral presentation of industrial settings by the instructor. The students derived the data for encoding through questioning, as they would ultimately do in the field. Three such case studies were presented and encoded by the students to the satisfaction of the instructor, who reviewed and corrected all student coding efforts. Four working days were devoted to this "case study" portion of the training.

3. Part III - Survey Form Encoding Procedures

On the final day of classroom instruction, two hours were devoted to a discussion of the procedures for properly encoding the Part III Form, Surveyor Assessment.

The balance of the final day was devoted to class discussion, and review of any material presented during the first five weeks of training. At this time, the instructor made a final determination of the qualifications of the candidate surveyors based on examination results and class work. Any candidate unable to satisfactorily perform NOES survey procedures at this point was not permitted to proceed to the field phase of surveyor training.

E. Field Training of the NOES Surveyor

Field training of the candidate surveyor lasted approximately thirty days, and consisted of gradually increasing survey responsibilities under the direct supervision of the team leader to whom the candidate had been assigned. Prior to their arrival in the field, the classroom instructor discussed each candidate with his or her team leader, identifying any potential areas of weakness, and suggesting field training areas of emphasis as necessary.

The field training phase was divided into several segments, which were variable in length, depending upon the expertise of the individual surveyor, as determined by the team leader.

1. Assisted by experienced members of his team, the team leader reviewed and discussed survey procedures with the candidates through questioning and "role-playing" exercises based on current field experience. Particular emphasis was placed on survey initiation procedures (initial contact with a facility designated for survey) interview techniques, and identification of intended controls for chemical and physical exposures. This review/instruction process consumed 2-3 days, dependent upon the capability of the candidate surveyor.
2. Each candidate accompanied an experienced surveyor, assigned by the team leader, on three surveys. During this period, the candidate independently recorded his or her Part I, II and III observations. This parallel encoding was reviewed by both the experienced surveyor and the team leader, and errors or omissions discussed and corrected. Following these initial surveys, the candidate was expected to schedule and conduct the Part I management interview in three additional facilities, with an experienced surveyor in attendance to provide necessary assistance. Part II of the survey was conducted by the experienced surveyor, while the candidate independently recorded his/her observations. Thorough discussion of all survey observations were again conducted, and any areas of difficulty resolved. This process required 4 or 5 days, depending upon candidate ability.
3. If, in the judgement of the team leader, the candidate successfully completed Phase 2 of the field training through practical demonstration of knowledge, he/she assumed responsibility for the complete conduct of four additional facility surveys. Candidates were accompanied on these surveys by an experienced surveyor who provided assistance as necessary. The surveys became progressively more complex. Review and discussion of these surveys were again conducted by the team leader and other surveyors. In conjunction with these specific reviews, general discussions were held at the weekly team meetings to correct any remaining areas of difficulty. This segment of the field training required 7-10 days, dependent upon the candidate's ability, and survey complexity.

4. If, in the judgement of the team leader, the candidate adequately demonstrated a thorough knowledge of, and ability to perform surveys in accordance with established protocol, he/she was assigned to independently conduct surveys of increasing complexity. All encoded surveys were reviewed by the team leaders prior to submission to survey Headquarters.

VI. FACILITY SCHEDULING, SURVEYING, AND DECISION MATRIX FOR FIELD STAFF

The scheduling of selected facilities was a multi-phase process involving several contacts via telephone and written correspondence. Each establishment in the sample was contacted by telephone by the survey design contractor, through their telephone center in Rockville, Maryland, to verify (and correct, if necessary) facility-specific information derived from the computerized sample file, and to obtain some supplementary information useful to the conduct of the survey.

In general, the following information was verified (or corrected):

- Establishment name.
- Street address.
- Standard Industrial Classification (SIC).

Supplementary information obtained included:

- Information on any other worksites owned or managed by the same company and located in the same PSU.
- Name, title, and telephone number of a designated contact person in each establishment.
- Names of any unions at the establishment, and contact information for each local union organization identified.

The above information, for each sample facility in the PSU was transmitted to the NIOSH project officer approximately one month prior to the assignment of a PSU to the field staff.

The facility listings were distributed as follows:

- Three copies to the appropriate NIOSH Regional Office.
- Two copies to the field team.
- Three copies retained at NIOSH in Cincinnati, Ohio.

A notification letter (see Appendix A) was sent to the contact person in each facility and, if applicable, to the local union representative(s). The letter explained the intent of the survey, the sample selection procedure (in general terms), and the statutory authority to conduct research. In addition, the letter explained NIOSH's obligation to safeguard trade-secret information, and stated that a surveyor would be contacting them to schedule a walk-through investigation of their facility.

Shortly after receipt of their facility assignments for a PSU, the field surveyors telephoned the contact person(s) to verify information regarding the facility listing, to explain or answer questions about

the survey, and to schedule an appointment for the site visit. The following example criteria exemplify the decision process utilized during the survey.

Size:

If the company had less than eight employees currently on the payroll the facility was dropped from the survey. If there were more employees on the payroll than stated on the listing, the facility was surveyed and the correct number of employees was entered in the space provided in the Part I Survey Form.

Standard Industrial Classification (SIC):

If the SIC was determined to be different than stated on the listing and the corrected SIC caused the facility to be out-of-scope, the facility was dropped from the survey. If, however, the corrected SIC was in-scope, the facility was surveyed as planned and the programmer specialist was notified of the SIC change. Appendix B lists the SIC codes that are in-scope. Any SIC not on this list is out-of-scope.

Government, Duplicate Authority, Temporarily Closed, or Out of Business:

Federal, State, and Local government facilities, if mistakenly included on the listing, were dropped from the survey. Establishments (e.g., railroads and transit systems) covered under a preempting occupational safety and health statute were dropped from the sample. If the initial telephone contact indicated that an establishment was no longer in business, the surveyor visited the location to verify the status of that company. Facilities verified to be out of business were dropped from the survey. Facilities temporarily closed were rescheduled for a later date.

Address Changes:

One objective in the design of the survey was to consider sample facilities as single plants or locations. However, a company occasionally operated in more than one location, or was composed of several plants or branches and was listed only once on the sample universe file with a single address and/or employee total. Some of these branches, not listed on the sample universe file, were identified during the screening process. If other facilities in the PSU were owned, managed, or operated at other locations, the identity and size of these additional facilities were recorded. An alphabetic list derived from the universe file was then searched to determine if the new location should be treated as an addition to the sample frame.

Additional facilities reported to be managed by a sample establishment, and found on the universe listing were dropped because their presence on that listing meant they already had their proper chance of selection. Additional facilities not appearing on the list were given a chance of selection in the interview sample. This was accomplished by means of a worksheet designed to select additional facilities with probabilities reflecting their chance of selection had they been originally listed in the sample universe file.

A change of address resulting from actions by the U.S. Postal Service did not alter the validity of the sample establishment. The surveyor was instructed to verify that the facility in question was the establishment selected for the survey.

Any establishments that had moved to a location outside the boundaries of the PSU were dropped from the survey. If an establishment moved its operation to a new location within the PSU, the following rules applied:

1. The facility was surveyed if the new location was not already listed in the universe of eligible facilities.
2. The facility was dropped from the survey if the new location was listed in the universe of eligible facilities, but had not been selected.
3. If the new location was listed in the universe of eligible facilities and had already been selected, the facility at the new address was surveyed, and the facility listed at the old address was dropped.

Administrative offices, facilities with multiple addresses, and facilities having more than one building or with only one address listed were completed as follows:

1. Facilities which consisted only of administrative offices were dropped from the survey.
2. If a facility had multiple addresses, only the address or addresses selected and listed were surveyed.
3. A complex of buildings was considered a single facility. Therefore, all buildings associated with the address listed were surveyed.

Changes in Company Name:

If only the name of the company was changed, and all other selection criteria (address, size, SIC) remained the same, the facility was surveyed and the change noted on the appropriate form(s). If other particulars also changed, previously stated rules applied.

Refused Entry:

There were 125 cases of refused entry; 113 of which were satisfied through the shadow sample procedure¹ and 12 through a

¹ Each establishment selected for the survey had a reserve sample establishment selected with it to replace the attrition due to non-response. If all efforts by the telephone interviewer, surveyor, and the team leader did not succeed in obtaining cooperation, this reserve facility was used as a substitute for the non-cooperating facility. If the substitute was found to be out-of-scope, or refused to cooperate, the original sample facility was retained in-sample and a court order obtained to secure cooperation from the original facility.

court order (inspection warrant). A series of events occurred prior to implementation of an inspection warrant or shadow sample procedure.

If the surveyor encountered strong resistance during the telephone contact and could not set a mutually acceptable survey date, the surveyor documented the conversation and turned over all pertinent information to the team leader. The team leader then contacted the company representative to either schedule a survey date or be refused entry. If the team leader was successful in obtaining an appointment date, the information was returned to the surveyor for completion. If the team leader was refused entry, the alternate project officer was notified.

There were a number of cases where the surveyor had an appointment but upon arrival at the facility was refused entry. The surveyor explained in a polite but firm manner that he/she had authority under federal law to enter the facility and showed the company representative his/her NIOSH identification card relating to right of entry. If entry was still denied, the surveyor left the premises and contacted the alternate project officer.

Upon being notified of a refusal, the alternate project officer contacted the sample design contractor for a reserve facility. Information on the reserve facility was transmitted to the surveyor through the team leader. If the facility cooperated and voluntarily allowed the surveyor to conduct the survey, the reserve facility was used as a substitute for the original sample establishment. If, however, the reserve facility was non-cooperating, or out of scope, as determined by the sample design contractor's telephone interviewer or the field surveyor (or both), the original sample establishment was contacted and informed that an inspection warrant would be sought. Several facilities, after being informed that NIOSH would exercise its legal authority to gain entry, relented and allowed the surveyor to conduct the survey.

Completing surveys in the twelve facilities which required an inspection warrant consumed an inordinate amount of time and expense. In retrospect, it was fortunate that a court order was necessary in only 0.3% of the facilities sampled.