

RESEARCH RESULTS DIGEST

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Development of Training Material for Highway Construction Personnel

An NCHRP digest of the findings from the final report on NCHRP Project 20-25(3), "Development of Training Material for Highway Construction Personnel," conducted by SNI International Resources, Inc. Mr. Richard P. White served as Principal Investigator.

INTRODUCTION

This digest includes a plan for establishing a nationally applicable training program for highway-agency, consultant, and contractor personnel as means to enhance the quality of highway construction. A framework for a national construction training program has been developed and comprehensive training packages for 15 courses to aid in the training of field and office personnel involved in several highway construction activities have been prepared.

Budget restrictions, loss of skilled personnel, increased responsibility placed on quality assurance personnel, the changing role of the contractor with respect to quality control, and demands for faster construction of projects have all affected the highway construction process in the United States. Training of field and office personnel involved in highway construction activities is an effective approach to improving the quality of highway construction and to reducing life-cycle costs. However, current training programs for these personnel are neither comprehensive nor widely available. There is a need to develop comprehensive training packages to support a nationally applicable training program for highway-agency, consultant, and contractor personnel. NCHRP Projects 20-25(2) and 20-25(3) were performed to address this need.

BACKGROUND

An initial phase of research was conducted under NCHRP Project 20-25, "Training Needs for Highway Construction Personnel," by the University of Maryland Transportation Studies Center and Bergstralh-Shaw-Newman, Inc. This research, completed in 1991, provided the following:

1. A comprehensive work analysis to define the activities and tasks undertaken by construction personnel;
2. A survey of existing training and certification programs and of the needs for training and certification to perform construction activities and tasks;
3. An evaluation of certification programs to determine how well they reflect construction work; and
4. A framework for a national construction training program with course/module titles and skeleton contents, showing the match between course/modules and both certification and the work analysis.

The national training program included 62 training courses categorized under 9 major areas. The evaluation of certification programs concluded that the National Institute for Certification in Engineering Technologies (NICET), founded by the National Society of Professional Engineers (NSPE), is the most

reliable means available for measuring highway construction knowledge and ability. The examinations are rigorous and the certification by NICET is a respected credential.

A second phase of research was conducted under NCHRP Project 20-25(2), "Training for Highway Construction Personnel," by SNI International Resources, Inc. In this research, completed in 1994, the 62 courses identified in the initial research were consolidated into 45 courses categorized under 8 areas, as listed in Table 1. Descriptions and lesson-plan outlines were developed for each course. Each course description included the following elements:

1. Title and number,
2. Scope statement,
3. Behavioral objectives,
4. Target audience,
5. Overall course length (in hours),
6. Instructor's qualifications,
7. NICET Work Elements references, and
8. Related available training materials and references.

Each lesson-plan outline included the following elements:

1. An outline identifying course elements;
2. Amount of time devoted to each course element;
3. Required training aids and other media;
4. Required logistical support; and
5. Related reference, training aids, instructor's materials, and NICET Work Elements.

Comprehensive training packages were also developed for teaching three courses: Project Documentation, Environmental Protection Procedures, and Bridges and Minor Drainage Structures. Each training package included an instructor's guide and a participant workbook. In addition, a preliminary plan was recommended for promoting and facilitating the use of the training program and project products by highway agencies, contractors, consultants, and other construction agencies. The plan stipulated involvement by all organizations involved in construction and training activities, including the Federal Highway Administration, state highway agencies, contractors, consultants, and associations.

This digest provides a description of the work performed in the third phase of research. The material in this digest is extracted from the final report on NCHRP Project 20-25(3).

FINDINGS

In this phase of research, completed in 1997, comprehensive training packages for teaching 12 courses were developed. The plan, developed in the earlier phase of research, for promoting and facilitating the use of the recommended training program was also reviewed and revised.

Training Packages

Comprehensive training packages were developed for teaching the following 12 courses:

1. Interpreting contract plans
2. General safety
3. Work zone traffic control devices I
4. Work zone traffic control devices II
5. Work zone traffic controls
6. Electrical systems for signs, signals, and lighting
7. Traffic signals and lighting
8. Pavement markings
9. Surveying I
10. Surveying II
11. Surveying III
12. Minor drainage structures

Each training package included an instructor's guide and a participant workbook. Both documents contained handout materials. The instructor's guide also contained questions that could be used for review discussions and tests. In addition, suggested video resources, classroom exercises, and field practice sessions were cited.

Plan for Promoting Use of the Training Program

A plan for promoting and facilitating the use of the training program and project products was developed based on the plan recommended in an earlier research effort. Several items are identified as necessary for achieving the goals of the program, including the following:

1. Inform public sector transportation agencies, especially state departments of transportation personnel, of the training program;
2. Inform contractors, consultants, and suppliers of the training program, possibly through respective trade associations;
3. Provide easy access to training material;
4. Ensure flexibility in training materials to allow an easy integration of user's guidelines and technical information; and
5. Ensure availability of training materials at an affordable cost.

The plan further suggests a strategy of "educate, excite, and enlist" to help promote use of training materials. The strategy emphasizes the need to "educate" potential users about the program, "excite" them about the potential benefits of the program, and "enlist" them to use available materials.

The plan also proposes several means for disseminating information, including via direct mail, preparing feature stories for related publications, participation in trade associations' technology transfer functions, and use of the

TABLE 1 Framework for a national construction training program

General Series GEN-1: Contents of Standard References GEN-2: Interpreting Contract Plans GEN-3: Construction Mathematics GEN-4: Project Documentation GEN-5: Governmental Requirements GEN-6: First-Aid Procedures GEN-7: General Safety GEN-8: Environmental Protection Procedures
Traffic Control Series TRC-1: Work Zone Traffic Control Devices I TRC-2: Work Zone Traffic Control Devices II TRC-3: Work Zone Traffic Controls TRC-4: Guardrail and Median Barrier TRC-5: Guardrail Installation TRC-6: Median Barrier Installation TRC-7: Electrical Systems for Signs, Signals, and Lighting TRC-8: Foundations for Signs, Signals, and Lighting TRC-9: Breakaway Sign Installation TRC-10: Traffic Signals and Lighting TRC-11: Pavement Markings TRC-12: Fences and Screens
Construction Surveying Series SRV-1: Surveying I SRV-2: Surveying II SRV-3: Surveying III
Landscaping Series LND-1: Roadway Landscaping I LND-2: Roadway Landscaping II
Earthwork Series EWK-1: Soils and Aggregates EWK-2: Clearing and Grubbing EWK-3: Excavation EWK-4: Embankment
Concrete Series PCC-1: Forms, Falsework, and Reinforcement PCC-2: Concrete Delivery and Testing PCC-3: Standard Concrete Operations PCC-4: Concrete Paving Equipment Requirements PCC-5: Concrete Paving Operations PCC-6: Concrete Pavement Joint Construction PCC-7: Central-Mix and Concrete Batch Plants
Structures Series STR-1: Bridges and Minor Drainage Structures
Asphalt Pavement Construction Series ASP-1: Asphalt Paving Equipment ASP-2: Surface Preparation ASP-3: Asphalt Paving Operations ASP-4: Asphalt Pavement Joints ASP-5: Roller Operations—Asphalt ASP-6: Asphalt Materials and Testing ASP-7: Bituminous Batch and Drum Facilities ASP-8: Asphalt Plant Calibration

Internet. Deploying marketing strategies to inform minority- and women-owned businesses of the program and its potential benefits is suggested. The plan recommends developing training packages for the remaining courses and assigning an organization the responsibility for marketing efforts, sales, distribution, maintenance, and administration of the training program—a role that could be carried out by a public agency, a nonprofit association, or a private firm.

CONCLUSIONS

Training field and office personnel involved in highway construction activities has been recognized by state highway agencies, construction contractors, consultants, and other organizations as an effective means for improving the quality of highway construction and reducing life-cycle costs. The initial phase of research laid the groundwork for a training series that would provide considerable benefit to highway construction workers and inspectors nationwide and, in turn, to the traveling public and taxpayers. In the second phase of research, a framework for a national construction training program, which included 45 courses categorized under 8 major areas, was developed. Descriptions and lesson plans for each of these courses and comprehensive training packages for three courses were developed.

To further support the development of a national training program, training packages were developed for 12 additional courses under NCHRP Project 20-25(3), "Development of Training Material for Highway Construction Personnel." In addition, a plan was developed for promoting and facilitating the

use of the recommended training program for highway construction personnel.

FINAL REPORT

The agency final report, titled "Development of Training Material for Highway Construction Personnel," gives a detailed account of the project, the findings, and the conclusions. The report has been prepared in several parts and includes a summary report, a promotional plan, an instructor's guide and a participant workbook for each of the twelve courses. The report has been distributed to NCHRP sponsors (i.e., state transportation departments) and the T² centers. The report is available on microfiche for loan by writing to the NCHRP. The set of microfiche may also be purchased by writing to the TRB Publications Office, 2101 Constitution Avenue, N.W., Washington, DC 20418. The cost is \$100.00 including postage. Checks or money orders should be made payable to the Transportation Research Board. Purchase may also be made using MasterCard, Visa, or American Express by calling 202/334-3214, or by faxing the request to 202/334-2519.

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