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Archived Information

Occupational

Skill

Standards

Projects

Occupational Skill Standards Projects

**Compiled by:
Carolyn S. Lee
Carla DeWitt**

U.S. Department of Education

**Robert Litman
U.S. Department of Labor**

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Introduction

In an effort to narrow the gap between the skills needed to succeed in today's workplace and the knowledge that education and training programs impart to learners, the United States departments of Education (ED) and Labor (DOL) funded twenty-two business-education-labor partnerships to develop voluntary skill standards for various industries in 1992 and 1993. Of the twenty-two projects, sixteen are funded by ED and six by DOL. These projects identify what workers must know and be able to do to qualify for beginning-to-expert level occupations in various sectors of our nation's economy. These voluntary skill standards can be used by employers, workers, unions, and educators to communicate expectations for occupational skills and to evaluate both the skills of individuals and the success of education and training programs in teaching those skills. The standards will promote lifelong learning, raise workforce skills, and encourage changes in workplace practices to increase productivity and to improve the quality of goods and services produced. Since 1992, more than \$40 million in federal and non-federal funds have been invested in the development of these voluntary occupational skill standards. It is estimated that these twenty-two projects potentially cover about 17.5 million workers or 18.4 percent of the 95.0 million workers in the employment universe (Institute for Educational Leadership, 1994).

These projects have used different approaches to define the knowledge, skills, and abilities required to perform a job. Some have used the traditional task analysis approach, others have used the generic approach, that is, they defined knowledge and skills in general terms. Others have used the scenario approach which illustrates a real-life work situation, a routine procedure and an unanticipated problem the student must master.

This is the second edition of this publication. The first edition was published in Spring 1994 and provided abstracts of the twenty-two projects and an executive summary of the report, "A Study of Business and Education Skill Standards." This edition provides brief descriptions and the current status of the twenty-two projects. Each summary describes a project in terms of the industry represented, the occupations for which skill standards have been developed, federal funds received, non-federal funds contributed (50 percent match required for the ED projects and 100 percent required for DOL projects), when standards and other deliverables will be available, a description of the standards document and companion document(s), excerpt(s) of sample standard(s), and the identification of project contact person(s). The publication also contains a matrix which depicts the following: industry and lead organization, status of a skill standard document, certification level(s), numbers of occupations for which standards are being developed, planned companion document(s), federal and nonfederal funds, the level of education for which standards are targeted and the job analysis method used to validate the standards. The twenty-two skill standards projects will result in the development and validation of at least sixty sets of voluntary occupational skill standards by late 1996.

This publication will serve as a valuable resource to the business, labor, education, and training communities interested in using these standards to inform their activities. The products available from these projects should help each of these communities in their efforts to promote productivity and contribute to the development of a workforce prepared for the 21st century.

Patricia W. McNeil
Acting Assistant Secretary
for Vocational and Adult Education
United States Department of Education

Timothy Barnicle
Assistant Secretary
for Employment and Training Administration
United States Department of Labor

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Part I

Occupational Skill Standards Projects

ADVANCED HIGH PERFORMANCE MANUFACTURING

National Coalition for Advanced Manufacturing (NACFAM)
1331 Pennsylvania Avenue, NW
Suite 1410, North
Washington, D.C. 20004-1703
C.J. Shroll
202-662-8968
202-662-8969 (fax)
cjshroll@aol.com

Project Period: 1 November 1993-31 October 1996

Federal Funding Source: Department of Education

Federal: \$889,582

Non-Federal: 1,056,091

Total: \$1,945,673

Occupational Area(s): Technical Workers

Status: First draft of the standards was published in December 1994. Next draft of the standards was published in April 1995. The final version of the standards will be available in October 1996.

Description of standards document: This document provides an overview and vision for the project as well as the methodology and basis for the research. It focuses on the first phase identification and validation of the skills that are important to advanced manufacturers with high performance workplaces. The standards fall under the headings of: communication and teamwork; math and measurement; workplace safety and health; problem solving; quality assurance; blueprint reading; manufacturing fundamentals; business planning and operation; computer use; product and process control; workforce issues; workplace skills; and learning skills. The standards contain the following five elements: what the action (skill) is; what the conditions are under which the action is performed; how good is good enough (criteria/measure); how the action will be measured (portfolio/test/observation); and why the action must be performed.

Description of companion document: In September of 1996, the second phase report will be available. This information will build on the findings of the first phase and provide the conditions, criteria and benchmarks for the skills. The conditions will indicate information such as whether the skill should be performed alone or as part of a group, whether computers or calculators should be used, or the context in which the skill should be demonstrated. Also included will be the measurement or documentation methods and

benchmark performance levels. The means of documentation will include a sign-off by previous employers, teachers, or community leaders as well as other assessment methods.

Excerpt(s) of a standard: Working alone with a calculator, (condition) add 10 two or three digit numbers (action) five times in three minutes with 100 percent accuracy (good enough), in order to perform necessary calculations for Statistical Process Control during the manufacturing process (why). This will be documented by third party or performance assessment (measurement).

Partners: American Association of Community Colleges, AC Delco Systems, Aerospace Industries Association, American Society for Engineering Education, Association for Manufacturing Technology, American Society for Training and Development, AT&T, Autodesk, Inc., BGSI, CAMP, Caterpillar Foundation, Center on Education for Employment, Central Florida Community College, Charmilles Technologies Corporation, Community College of Philadelphia, Cybernet Systems Corporation, Delaware Valley Industrial Resource Center, Donsco Inc., Educational Development Center, Electronics Manufacturing Productivity Facility, Fashion Institute of Technology, GE Superabrasives, Grand Rapids Community College, Hughes Aircraft, Johnson Controls, Light Machines Corporation, Lockheed Martin, Lorain County Community College, Macomb Community College, Michigan Technological University, Milwaukee Area Technical College, National Alliance of Business, National Association of Manufacturers, National Center for Manufacturing Sciences, National Vocational Technical Education Foundation, National Institute of Standards and Technology, Northwestern Michigan College, Osram Sylvania, Philip Morris USA, Production Technology, Inc., Rochester Institute of Technology, Science Applications International Corporation, Siemens, Strategic Education Services Inc., Trident Technical College, UAW Chrysler National Training Center, UAW/Chrysler, University of New Orleans Business Higher Education Council, University of Wisconsin-Extension, VICA, Waukesha County Technical College, Wisconsin Instruction Development System, Winterton Associates, Work and Technology Institute, Wyoming Public Schools, Xerox.

AGRICULTURAL BIOTECHNOLOGY

National FFA Foundation
P.O. Box 15160
Alexandria, Virginia 22309-0160
Bernard Staller
703-360-3600 x268
703-360-5524 (fax)
natlffa@aol.com

Project Period: 14 June 1993-13 June 1996

Federal Funding Source: Department of Education

Federal: \$998,059

Non-Federal: 1,047,895

Total: \$2,045,954

Occupational Area(s): Agricultural Biotechnology Technician

Status: Standards were published in December 1994.

Description of standards document: National Voluntary Occupational Skill Standards: Agricultural Biotechnology Technician defines the technical, employability, and academic skills needed to work as a technician in the emerging field of agricultural biotechnology. Technical skills required of an agricultural biotechnician include communication, safety, basic lab skills, basic microbiology, cell biology techniques, quality control, nucleic acid techniques, protein techniques, regulatory compliance, greenhouse/growth chamber, plant field trials, and animal care and field trials. Employability skills include the ability to follow schedules, practice self-starting techniques, develop and use listening skills, document activities immediately, communicate well with others and recognize the organizational structure (chain of command) of an organization. Academic skills include subjects such as biology, physical science, mathematics and statistics. Under each skill category, the study lists specific knowledge or behaviors that demonstrate mastery of the category.

Description of companion document: An implementation guide for the standards will assist industry and educational institutions in developing training programs to prepare agricultural biotechnology technicians. The implementation guide includes assessment information for the technical skills, recommendations for linking standards with tech prep/school-to-work initiatives, agricultural biotechnology technical and career information, careers video, and instructional materials for high school agricultural

and science programs. The implementation guide (available 3/96) will be disseminated at industry hosted regional workshops.

Excerpt(s) of a standard: **Technical Skill:** Agricultural biotechnicians must be proficient in nucleic acid techniques, including the ability to determine specific DNA sequences.

Employability Skill: Agricultural biotechnicians must be able to acquire and record information, including the ability to recognize unexpected results, document activities immediately, and forward information appropriately.

Academic Skill: Cite and explain major cell processes such as respiration and photosynthesis.

Partners:

Agricultural Group of Monsanto Company, American Cyanamid Company, American Farm Bureau Federation, American Veterinary Medical Association, Biotechnology Industry Organization, Boatmen's First National Bank of Kansas City, CENEX/ Land O' Lakes, EDITEK, Inc., Equipment Manufacturers Institute, Fermenta Animal Health Company, International Chemical Workers Union, ISK Biosciences Corporation, John Deere, Kellogg Company, Metropolitan Life Insurance Company, Na-Churs Plant Food Company, North Carolina Biotechnology Center, Pioneer Hi-Bred International, Inc., Rhone-Poulenc Ag Company, Sandoz Agro, Inc., Santa Fe Pacific Foundation, SIGCO/MYCOGEN Plant Sciences, Upjohn Company, Alabama A&M University, Center for Occupational Research and Development, Colorado State University, Council for Agricultural Science and Technology, Missouri State Department of Elementary and Secondary Education, National FFA Alumni Association, National Association of Supervisors of Agricultural Education, National FFA Foundation, National Post Secondary Agricultural Student Organization, National Vocational Agriculture Teachers Association, National Young Farmer Educational Association, Kansas State Department of Education, National Council for Agricultural Education, University of Florida.

AIR CONDITIONING, HEATING, AND REFRIGERATION

V-TECS, Southern Association of Colleges and Schools
1866 Southern Lane
Decatur, Georgia 30033-4097
Victor Harville/Ronald McCage
800-248-7701
404-679-4556 (fax)

Project Period: 1 October 1992-30 January 1996

Federal Funding Source: Department of Education

Federal: \$606,140

Non-Federal: 653,070

Total: \$1,259,210

Occupational Area(s): Air conditioning, heating, and refrigeration technicians in residential, commercial, and industrial environments

Status: Draft standards were published October 1994. Final standards were published in February 1996, and accompanying standards in April 1996.

Description of standards document: Volume One identifies the knowledge, skills, and workplace behaviors required for heating, air-conditioning, and refrigeration technicians. Volume Two identifies the industry-derived standards of performance for the identified skills.

Description of companion document: V-TECS will publish an occupational analysis of the heating, air-conditioning, and refrigeration technician area after the conclusion of the project. Included will be a task analysis, tools and equipment, procedures, standards of performance, related academic skills, and a test item bank.

Excerpt(s) of a standard: **Technical Skill:** Charge refrigeration system.

Standard: The refrigeration system must be charged with the specified refrigerant to manufacturer's specifications using manufacturer's charging information. Applicable safety, code, and environmental regulations must be followed.

Partners: Air Conditioning Contractors of America, Air Conditioning Research Institute, Career College Association, International Union of Operating Engineers, Lennox Industries, Mechanical Service Contractors of America, National Association of Plumbing, Heating, and Cooling Contractors, National Association of Power Engineers, National Association of State Directors of Vocational and Technical Education,

North America Electric Heat Pump Alliance, Refrigeration Service Engineers Society, United Association of Journeyman and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada, Vocational Industrial Clubs of America.

AUTOMOBILE, AUTOBODY, MEDIUM/HEAVY TRUCK TECHNICIAN

National Automotive Technicians Education Foundation (NATEF)

13505 Dulles Technology Drive, Suite 2

Herndon, Virginia 22071-3421

Patricia Lundquist

703-713-0100

703-713-0727 (fax)

Project Period: 1 October 1992-30 March 1997

Federal Funding Source: Department of Education

Federal: \$995,007

Non-Federal: 995,007

Total: \$1,990,014

Occupational Area(s): Entry level automobile, autobody and medium/heavy truck technicians

Status: Automobile and autobody training program standards were published in November 1993.
Medium/heavy truck technician training program standards were available in May 1994.

Description of standards document: The three program standards volumes include: tasks, tools and equipment, hours and instructor qualifications. Automobile standards cover the following areas: brakes; electrical/electronic systems; engine performance; suspension and steering; automatic transmission and transaxle; engine repair; heating and air conditioning; and manual drive train and axles. Autobody standards cover: non-structural analysis and damage repair; structural analysis and damage repair; mechanical and electrical components; plastics and adhesives; and painting and refinishing. Medium/heavy truck standards cover the following areas: diesel engines; suspension and steering; brakes; electrical/electronic systems; preventive maintenance inspection; gasoline engines; drive train; and heating and air conditioning.

Description of companion document: Applied Academics and Workplace Skills Books (one for each of the three areas) includes the Basic/Essential Skills Taxonomy Codes and the application of that skill by an automobile, autobody, or truck technician in language arts, mathematics, and science academic skills. There is a matrix of the academic skills use in the technical area. Also included are narrative statements from each academic area. Workplace skills are identified.

Excerpt(s) of a standard: **Automobile--Brakes:** Check operation of parking brake indicator light system.

Autobody--Mechanical and Electrical Components: Remove and replace power rack and pinion steering gear; inspect and replace mounting bushings and brackets; ensure proper mounting location.

Medium/Heavy Truck--Gasoline Engines: Inspect pans, covers, gaskets, and seals; replace as needed.

Partners:

American Automobile Association, American Automobile Manufacturers Association, American Honda Motor Company, Inc., Association of International Automobile Manufacturers, Inc., Automotive Service Association Inc, Automotive Service Industry Association, Automotive Training Managers Council, Automotive Warehouse Distributors Association, Inc., Better Business Bureau, Chart Industries, Inc., Chrysler Motors Corporation, Ford Motor Company, Freightliner Corporation, General Motors Corporation, Inter-Industry Council of Automotive Repair, Isuzu Truck of America, Inc., National Association of State Directors of Vocational Technical Education Consortium, Navistar International Transportation, Inc., Niagara Mohawk Power Corp., Nissan Motor Company, Pittsburgh Paint and Glass, Ryder Commercial Leasing and Services, Snap-On Corporation, Sun Electric, Toyota Motor Sales U.S.A., Inc., Vocational Industrial Clubs of America, Vocation-Technical Education Consortium of States.

BIOSCIENCE

Education Development Center (EDC)

55 Chapel Street

Newton, Massachusetts 02158

Judith Leff/Monica Aring

617-969-7100

617-332-4318 (fax)

judyl@edc.org

Project Period: 1 October 1992-30 December 1995

Federal Funding Source: Department of Education

Federal: \$1,074,922

Non-Federal: 1,114,955

Total: \$2,189,877

Occupational Area(s): Beginning- to mid-level bioscience technical specialists (20 related occupations)

Status: Standards were published in April 1995. Bioscience Education and Training Program Directory was published in August 1995. Guidelines for Education and Training: Using the Skill Standards will be published in early 1996.

Description of standards document: Gateway to the Future: Skill Standards for the Bioscience Industry contains 34 “integrated” skill standards. Each of the 34 integrated skill standards contains the following components: a scenario presenting a real life work situation, including a routine procedure and an unanticipated problem the student must master; the workplace setting in which the scenario would occur, (research and development, manufacturing, clinical laboratories, or generic--applicable to all settings); key competency areas representing the bioscience technical specialist's major areas of responsibility, which must be mastered to successfully perform the scenario's routine procedure; tasks which must be mastered to solve the scenario's problem; skills, knowledge, and attributes (general and industry-specific) necessary to master the scenario's routine procedure and problem; and tools and equipment routinely used by technical specialists in bioscience work.

Description of companion document: Bioscience Education and Training Program Directory provides information about more than seventy current school- and work-based programs from across the country that prepare people for beginning-level technical occupations in research and development, clinical laboratory testing and diagnostic work, and production in

pharmaceutical, biotechnology, and clinical laboratory workplaces. The program descriptions include program level and length, learning sites, summaries of program contents, unique features, and contact information. Also included is a report summarizing trends in bioscience education and training and “best practice” program features.

Guidelines for Education and Training: Using the Skill Standards are guidelines written by educators, industry trainers, and EDC. They consist of seven booklets with much practical “how to” information for educators, industry and union trainers, career counselors, work-based mentors, and others. The booklets cover: K-12 Curriculum and Teaching Strategies; Post-Secondary Education; Work-Based Learning; Teacher, Career Counselor and Work-Based Mentor Development; Assessment and Certification; and Articulation, plus an Introduction. These guidelines will be published in early 1996.

Excerpt(s) of a standard: **Scenario:** One part of your laboratory responsibilities is to unpack and process biological samples. While unpacking samples one morning, you notice that one of the samples is leaking from the container. What should you do? What are the tasks necessary to perform the routine part of this situation? What are the tasks necessary to solve the problem part of this situation?

Partners: American Society for Clinical Laboratory Science, Biotechnology Industry Organization, Pharmaceutical Manufacturers Association, PDA, Inc., American Association of Community Colleges, National Association of State Directors of Vocational Technical Education, Service Employees International Union, American Chemical Society.

CHEMICAL PROCESS INDUSTRIES

American Chemical Society (ACS)
1155 16th Street, NW
Washington, D.C. 20036
Kenneth Chapman/Robert Hofstader
202-872-8734
202-872-8068 (fax)
kmc97@acs.org

Project Period: 1 June 1993-30 November 1996

Federal Funding Source: Department of Education

Federal: \$1,098,310

Non-Federal: 1,111,731

Total: \$2,210,041

Occupational Area(s): Entry level chemical laboratory technicians and process technical operators

Status: Draft standards were published in November 1994. The final version of the standards will be published in May 1996.

Description of standards document: The standards for both occupational areas cover employability skill standards, performance-based technical skill standards, and critical job functions. For chemical laboratory technicians, the employability skill standards address: mathematics and statistics; computer literacy skills; communication skills; workplace skills; and general laboratory skills. The critical job functions are to: maintain a safe and clean laboratory adhering to environmental/health and safety regulations; sample and handle chemical materials; conduct physical tests; perform chemical analysis; perform instrumental analysis; plan and design experiments; and synthesize compounds.

For process technical operators, the employability skill standards address: mathematics and statistics; computer literacy skills; communication skills; workplace skills; and general plant skills. The critical job functions are to: maintain safety, health and environmental standards in the plant; handle, store and transport chemical material; operate, monitor and control continuous processes; operate, monitor and control batch processes; provide routine and preventive maintenance and service to processes, equipment and instrumentation; and analyze plant materials.

Description of companion document: The following companion documents will be developed:

1. Sets of employability and performance-based technical skill standards for two occupations: Chemical laboratory technicians and process technicians.
2. A comprehensive set of over 700 learning objectives divided into appropriate modules for the two occupations cited above.
3. A report with recommendations on local alliances to support human resource development for the occupations cited above.
4. A guide to facilitate the determination of the readiness of post-secondary education programs for chemical laboratory technicians and/or process technicians to “teach to the standards.”
5. A report with recommendations that addresses the role of educational technology, and particularly simulations, in providing instruction for developing skills and knowledges that the chemical process industries skill standards have identified.
6. A report with recommendations and models that addresses the issues of marketing communications to bring skill standards information to the attention of appropriate stakeholders for employers and academic organizations.

The American Chemical Society intends to develop a comprehensive book to address the many issues pertinent to human resources development for chemical laboratory technicians and process technicians. The document will include the above materials, perhaps revised to better coordinate with other information included in the book.

Excerpt(s) of a standard: **Chemical Laboratory Technician--General Laboratory Skill:**
Calibrate containers, flasks, balances, safety testing equipment, air and water monitoring equipment.

Process Technical Operator--Handle, Store, and Transport Chemical Materials Skill: Inspect storage drums and containers, and clean, use, or dispose of them as appropriate.

Partners: American Association of Community Colleges, American Institute of Chemical Engineers, American Petroleum Institute, American Society for Training and Development, Chemical Manufacturers Association, International Chemical Workers Union, Partnership for Environmental Technology Education, Synthetic Organic Chemical Manufacturers Association, Technical Association of the Pulp and Paper Industry.

COMPUTER AIDED DRAFTING AND DESIGN (CADD)

National Coalition for Advanced Manufacturing (NACFAM)
1331 Pennsylvania Avenue, NW
Suite 1410, North
Washington, D.C. 20004-1703
Jane Beardsworth
202-662-8960
202-662-8964 (fax)
nacfam@explorer.clark.net
jbeardsw@bmpcoe.org

Project Period: 1 November 1992-31 January 1996

Federal Funding Source: Department of Education

Federal: \$1,096,683

Non-Federal: 1,416,717

Total: \$2,513,400

Occupational Area(s): Computer Aided Drafting and Design (CADD) users across all industries

Status: Standards were published in April 1994.

Description of standards document: This skill standards document represents skills that are core to all CADD disciplines, generic to all software and entry level. The standards include: fundamental drafting skills; fundamental computer skills; basic CADD skills; advanced CADD skills; related academic skills in communication, math, and science; employability skills; tools and equipment for CADD training; recommended hours of instruction; and qualifications of the instructor.

Description of companion document: The measurability supplement is a list of the technical skills further broken out to include evaluation criteria and objectives. An exam document has also been produced and is currently in its pilot phase.

Excerpt(s) of a standard: **Technical Skill:** Plot drawing on media using correct layout and scale.

Related Academic Skill: Math--Basic arithmetic operations - compute addition, subtraction, multiplication, division (mentally and/or calculator) for the following categories: whole numbers, decimals, fractions, and mixed numbers.

Employability Skill: Use company resources responsibly (e.g. supplies, equipment).

Partners:

Society for Manufacturing Engineers, Macomb Community College, Trident Technical College, Milwaukee Area Technical College, New England Institute of Technology, Ford Motor Company, Lincoln Technical Institute, Bentley Systems, Phelps Career Academy, ITT Technical Institute, North Georgia Technical Institute, South Central Technical College.

ELECTRICAL CONSTRUCTION

National Electrical Contractors Association (NECA)
3 Bethesda Metro Center
Suite 1100
Bethesda, Maryland 20814-5372
Charles Kelly
301-657-3110
301-215-4500 (fax)

Project Period: 1 December 1992-30 September 1995

Federal Funding Source: Department of Labor

Federal: \$12,000

Non-Federal: 695,000

Total: \$707,000

Occupational Area(s): Electrical construction worker, electrical line construction worker, and electrical residential construction worker

Status: Standards were published in November 1995.

Description of standards document: The standards include 19 duty areas. Tasks are described by frequency and importance. The use of tools are identified as well as "Knowledges, Skills and Abilities" linked to the job tasks and ranked according to importance. A curriculum guide, as well as a bibliography of commonly used texts and references, are included in the document to help curriculum planners and training organizations develop a comprehensive course of study that will encompass the skills necessary for a successful career. Thousands of journeymen and apprentice electrical workers, both union and non-union, and their supervisors, employers, and trainers were surveyed to verify the job tasks and duties initially identified through written materials, observation and interviews. The data compiled as a result of surveying the organized and open shop sectors of the electrical construction industry was in agreement with minor differences. Work is continuing on identifying performance indicators and assessment of the standards. Also included in the document are components that provide suggestions for educators in preparing students for this industry and a depiction of what working in this industry entails.

Description of companion document: The curriculum guide has been incorporated into the standards document.

Excerpt(s) of a standard: Electrical Construction Worker (ECW)

Planning and initiating a project/Daily : When planning a new project, an ECW must study blueprints and specifications. Materials, supplies, and equipment must be ordered to complete the job.

Partners:

Independent Electrical Contractors, Inc., International Brotherhood of Electrical Workers, National Joint Apprenticeship and Training Committee, University of Tennessee, Construction Labor Research Council, Simpson Electric Company, Inc., LRA Electric, Inc., Brazell Electric Company, North Penn Electric, Inc, Kelso-Burnett Company, McWilliams Electric Company, Inc., Houston Community College System, Pfeiffer Electric Company, Britain Electric Company, Advantage Electric, Morrow Meadows, Clakins Electric, Kale Electric Company, Palomar College, State of California DIR-DAS, and the U.S. Department of Labor.

ELECTRONICS

Electronics Industries Foundation (EIF)
919 18th Street, NW
Suite 900
Washington, D.C. 20006
Irwin Kaplan/Molly Mannon
202-955-5823
202-955-5837 (fax)
mmannon@aol.com

Project Period: 1 October 1992-31 March 1996

Federal Funding Source: Department of Education

Federal: \$1,091,233

Non-Federal: 1,091,317

Total: \$2,182,550

Occupational Area(s): Entry level electronics technicians (covers those employed within basic and applied research, product development, manufacturing, marketing, maintenance, and repair of electronic components devices and systems)

Status: Standards were published in June 1994. Measurement criteria for the skill standards were published in December 1995.

Description of standards document: Raising the Standard: Electronics Technician Skills for Today and Tomorrow is based upon a detailed analysis of the duties an electronics technician is expected to perform and a breakdown of each duty into the specific tasks required for its performance. The skill standards includes two lists of duties and tasks: the first is for the work-ready, entry-level electronics technician; the second, included as an example of specialty skills, is for the consumer electronics technician. The basic skills form the underpinnings for additional knowledge, skills, and techniques--including knowledge of equipment and techniques specific to one of the eleven specialties--not identified in detail here but required for work in some of the specialties. The rest of the manual presents the skill standards in detail, separated into five chapters: Desirable Behaviors and Work Habits; Technical Skills; Test Equipment and Tools Skills; Basic and Practical Skills; and Additional Skills.

Description of companion document: Characteristics of Competency, Measurement Criteria for Entry-Level Electronics Technician Skills was developed using teams of experts consisting of working technicians, line managers, and electronics instructors. The document presents the measurement criteria by skill category and skill standard. Each page identifies a skill standard,

describes the criteria to be successfully performed to determine that the standard has been achieved, and summarizes the achievements of the technician who meets that

standard. The measurement criteria are arranged using the same section names, order, and numbering used in Raising the Standard

Excerpt(s) of a standard: Demonstrate an understanding of acceptable soldering/desoldering techniques, including through-hole and surface mount devices.

Partners: Over 100 companies, educational institutions, and agencies have participated directly in the development of the skill standards and over 1,500 people have been given the opportunity to comment on the draft standards. Included with Electronics Industries Foundation (EIF) and Electronics Industries Association (EIA) in the management team responsible for overseeing this cooperative effort are the National Association of State Directors of Vocational Technical Education consortium (NASDVTEC), the International Association of Machinists and Aerospace Workers (IAM & AW), and Educational Testing Service (ETS).

ELECTRONICS

American Electronics Association (AEA)
5201 Great America Parkway
Box 54990
Santa Clara, California 95056
Cheryl Fields Tyler
800-284-4232
408-970-8565 (fax)

Project Period: 1 December 1992-30 September 1995

Federal Funding Source: Department of Labor

Federal: \$1,062,364

Non-Federal: 4,150,500

Total: \$5,212,864

Occupational Area(s): Administrative/information services support, pre/post sales, manufacturing specialist and manufacturing specialist team leader

Status: Standards were published in February 1994.

Description of standards document: Setting the Standard summarize the goal of the occupational area and describe competent performance for key job roles across the high-tech industry. They contain critical functions (what must be done to achieve the key purpose of the occupational area), the key activities needed to perform each critical function and performance indicators (how it is known when someone has performed well).

Description of companion document: Working in New Ways is a survey of 1,600 frontline workers which reveals important information about how work in the high-tech industry has changed, how work in high performance companies differs from the rest of the industry, and how well AEA's skill standards capture these changes. Complete survey results are available for all four occupational areas studied.

Excerpt(s) of a standard: **Critical function:** Assure production process meets business requirements.

Key activities (one example): Meet health, safety, and legal requirements with regard to process, product, and people.

Performance criteria: Health and safety requirements and procedures are implemented and followed at all times.

- Potential health and safety hazards are identified through continuous safety reviews.
- Confidentiality of proprietary information is protected according to company policy.
- Company standards of business conduct are followed.

Partners:

The list of numerous companies and organizations includes: IBM, AT&T, ELDEC, Tandem Computers, Hewlett-Packard, Motorola, Loral Space & Range Systems, Harris Corporation, Intel, Silicon Graphics, Intermec Corporation, MRS Technology, Cray Research, Apple Solectron, XEL Communications, Grass Valley Group, Middlesex Community College, Community College of Aurora, ITT Aerospace Communications, Pacific Circuits, Utah State Office of Education, Unisys, National Association of Manufacturers, American Society for Training and Development, and the U.S. Department of Labor.

GROCERY

Grocers Research and Education Foundation (GREF)

1825 Samuel Morse Drive
Reston, Virginia 22090
Gail Hanger/Thomas Zaucha
703-437-5300
703-437-7768 (fax)

Project Period: 1 September 1993-30 November 1996

Federal Funding Source: Department of Education

Federal: \$437,300

Non-Federal: 530,083

Total: \$967,383

Occupational Area(s): Customer Service/Stock Associate and Front-end Associate
(encompasses all entry level positions)

Status: Draft standards were published in June 1994. The final version of the standards will be published in Spring 1996.

Description of standards document: The standards include: a performance objective, including a task statement, conditions, and standard; performance steps; and, enabling competencies--the knowledge and skills (cognitive, affective and psychomotor) necessary for the performance of the task.

Description of companion document: The prototype interactive training program will use a multi-media approach to train on the front end associate area of customer service. The customer service interactive training program uses each task found in the National Skill Standards Front End Associate document. The training program uses live video footage of in-store situations. Eleven different scenes are depicted in the prototype program. Questions relating to each of the eleven situations are designed to illicit the appropriate response for the standard. A feedback loop is provided so that the student can gain the appropriate response. An instructor feedback system is also a part of the training module. A similar program will be designed for stock/production associate.

Excerpt(s) of a standard: **Task Statement:** Resolve transaction errors.

Conditions for performance: Cash register, form for recording errors on register, pen.

Standard: Error must be adjusted so that register tape will reflect the correct cost of purchase.

Performance Steps: Determine incorrect amounts; void incorrect amount in cash register; notify supervisor of incorrect amount in cash register; key in/input correct amount; and record error adjustment according to store policy.

Enabling Competencies: Follow store policy; read to obtain information; and perform mathematical computations.

Related Academic Skills: Compute--addition of complex numbers, whole numbers, and decimals; subtraction of complex numbers, whole numbers, and decimals.

Comprehend--the sequence of written information.

Partners:

American Institute of Baking, Anderson Consulting, Associated Wholesale Grocers, Buchanan Food Mart, Inc., Columbian Foods, Inc., Cornell University, D'Agostino Supermarkets, Distributive Education Council, Felpausch Food Centers, Food Marketing Institute, General Merchandise, Genuardi Supermarkets, Inc., Gregerson's Foods, Inc., International Dairy-Deli-Bakery Association, Kraft Foods, Mar-Val Food Stores, Inc., Mexican American Grocers Association, Michigan State University, NAWGA/IFDA, National Association of Convenience Stores, National Live Stock and Meat Board, National KAGRO, New Jersey Department of Education, Pay Less Supermarkets, Inc., Produce Marketing Association, Richfood, Inc., SUPERVALU, Inc., Spartan Stores, Inc., St. Joseph's University, Techau's, Inc., Tom's Super Thrift, Ukrop's Supermarkets, Uncle Phil's General Store, Vocation-Technical Education Consortium of States, Wakefern Food Corporation, Western Michigan University.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY (HMMT)

Center for Occupational Research and Development (CORD)

**601 Lake Air Drive
Waco, Texas 76710**

**Jim Johnson
817-772-8756
817-772-8972 (fax)
jjohnson@cord.org**

Project Period: 1 May 1993-31 August 1996

Federal Funding Source: Department of Education

Federal: \$513,800

Non-Federal: 513,900

Total: \$1,027,700

Occupational Area(s): Entry Level Hazardous Materials Management Technician
(encompasses several job titles)

Status: Standards were published in January 1995.

Description of standards document: The Hazardous Materials Management Technician (HMMT) skill standards are divided into thirteen job functions, which serve as headings for general statements of occupational requirements, skills and knowledge. Within each job function are supporting skills and knowledge that an HMMT must possess to be able to accomplish the job function successfully. A supporting item may apply to more than one job function. Immediately following the job functions is a more detailed breakdown of the supporting knowledge and skills related to the disciplines of mathematics, chemistry, toxicology, physics, and computer technology. Following these related academic skills are statements regarding the application of the Secretary's Commission on Achieving Necessary Skills (SCANS) report to HMMT and the relationship of the Quality Movement to the skills demanded of HMMTs. The final section of this standards publication gives guidance to curriculum developers when they convert the defined skills into educational curricula.

Description of companion document: The supplement to the standards document includes: industrial scenarios; occupational levels; assessment techniques and procedures; and, a curriculum guide.

Excerpt(s) of a standard: **Evaluate hazardous materials and hazardous waste sample data:**
Read and interpret blueprints, charts, curves, graphs, maps, plans, and spreadsheets from plotted and tabulated data.

Perform mathematical calculations following existing formulas and reference materials.

Check laboratory and/or field sample analyses by comparing to regulatory limits.

Partners: Partnership for Environmental Technology Education, National Environmental Training Association, National Environmental Health Association, National Association of Environmental Professionals.

HEALTH CARE

Far West Laboratory for Educational Research and Development (FWL)

730 Harrison Street

San Francisco, California 94107-1242

Sri Ananda/Vince Constabileo

415-241-2712

415-241-2702 (fax)

sananda@fwl.org

- Project Period:** 1 November 1992-30 November 1995
- Federal Funding Source:** Department of Education
- Federal:** \$1,020,156
Non-Federal: 1,062,612
Total: \$2,082,768
- Occupational Area(s):** Health care core (applying to all workers in health services) and four occupational clusters: therapeutic, diagnostic, information services, and environmental services
- Status:** Draft standards were published in December 1994. Final standards were published in November 1995.
- Description of standards document:** The standards make explicit the knowledge and skills health care workers need in order to provide quality health care. The standards include: a core set of skills essential and appropriate to all workers in health services; and four clusters of related occupations and functions. The standards for these core and cluster areas target health care workers primarily at the career-entry and technical (i.e., pre-baccalaureate) levels. The booklet also contains descriptions of project background, an approach to the development and validation of standards, the relationship of the National Health Care Skill Standards Project standards to generic workplace readiness standards, and occupational-specific standards, as well as guidelines for intended uses of the standards, (i.e., employer, human resources use, curriculum development and assessment).
- Description of companion document:** Not applicable.
- Excerpt(s) of a standard:** Safety Practices: Health care workers will understand the existing and potential hazards to clients, coworkers, and self. They will prevent injury or illness through safe work practices and follow health and safety policies and procedures.

The following may be included:

- Use Universal Precautions to control the spread of infection
- Apply principles of body mechanics, such as proper lifting techniques
- Prevent fire and electrical hazards
- Use instruments and equipment as directed
- Manage hazardous materials
- Follow emergency procedures and protocols
- Comply with pertinent regulatory guidelines, including OSHA standards

Partners:

Over one hundred health care organizations and educational institutions participated in this project. This includes: National consortium of health Science and Technology Education, Service Employees International Union, American Hospital Association, American Medical Association, American Society for Health Care Human Resources Administration, national Health Occupation Students Association, National Organization for Biology Teachers, and Pew Health Professions Commission.

HEAVY HIGHWAY/CONSTRUCTION AND ENVIRONMENTAL REMEDATION

Laborers-AGC Education and Training Fund
P.O. Box 479
Ohio Avenue
Kingston, Washington 98346
John Tippie/James Warren
360-297-4152
360-297-3368 (fax)
71112.1275@compuserve.com

Project Period: 1 July 1993-30 June 1996

Federal Funding Source: Department of Education

Federal: \$380,480

Non-Federal 380,575

Total: \$761,055

Occupational Area(s): Pipe laying work, concrete work, lead remediation and petro-chemical remediation

Status: Draft standards were available in February 1996. The final version of the standards will be published in early 1996.

Description of standards document: The standards will be in a scenario-based format. They will include a scenario and the following items associated with it: performance criteria; necessary workplace skills, knowledge and aptitudes; and relevant tasks from a master list of tasks.

Description of companion document: Not applicable

Excerpt(s) of a standard: **Scenario:** Slab-on-grade construction begins with the clearing and removing of all organic materials such as peat, grass, and tree roots. Once these materials are removed, the earth under the proposed concrete slab (sub-grade) is prepared to ensure that it will not settle or shift from the actions of frost and water by excavating the original soil and replacing it with a clean aggregate, compacted to near maximum density. The amount of material excavated depends on the type of existing soil and the anticipated load the slab will be required to withstand. Usually the excavation is deep enough to accommodate 4 inches of concrete and 2 inches of aggregate base material and still match surrounding features such as lawns, walks, streets, and garages. As the excavation proceeds, care is taken to avoid removing too much or too little material. Then the sub-grade is shaped to the same amount

of slope as the proposed finished surface. During grading, the sub-grade material is compacted to eliminate the chance of later settlement. Once the sub-grade is compact and uniform, aggregate base material is added, graded, and compacted. As each level of material is graded, the tolerance for deviation away from uniform grows smaller. For example, on the sub-grade level a standard industry tolerance is +/-0.10 of a foot. For the aggregate base level, a standard industry tolerance is +/-0.05 of a foot. In the finished slab, tolerances can range from 1/4", to less than 1/16' depending on the project design and specifications. Following base preparation, forms are built to contain the concrete until it hardens. For a normal slab, the forming process consists of staking 2"x4" or 2"x6" lumber at the edges of the proposed slab. For slabs of greater depth, more elaborate staking and bracing procedures are required. The form should be at the proper elevation, display the appropriate slope, and be within the design tolerances of elevation and alignment expected of the finished slab.

Partners:

University of Minnesota, Lane Community College, National Vocational Technical Education Foundation, North Lake College, Regents College, Ritangela Construction Associated General Contractors, Kiewit Construction Group, Inc., National Constructors Association, Laborers Local Union 172, AGC-Eastern Missouri Laborers Joint Training Fund, U.S. Army, Laborers' International Union of North America, AMERON, The Associated General Contractors, RESTEC Contractors, Inc., National Erectors Association, Laborers' Health & Safety Fund of North America, Northwest Laborers-Employers Training Fund.

HOSPITALITY AND TOURISM

Council on Hotel, Restaurant and Institutional Education (CHRIE)

1200 17th Street, NW

Washington, DC 20036-3097

Susan Dowler/Laura Pfalzer

202-331-5990

202-785-2511 (fax)

alliance@access.digex.net

Project Period: 1 December 1992-30 September 1995

Federal Funding Source: Department of Labor

Federal: \$999,775

Non-Federal: 1,884,292

Total: \$2,884,067

Occupational Area(s): Food service--server, cashier, host/ess, busser; Lodging--front desk clerk, bellperson, concierge, reservationist

Status: Standards were published in October 1995. A stakeholder report was published Summer 1995.

Description of standards document: The Council on Hotel, Restaurant and Institutional Education (CHRIE), in conjunction with the Hospitality and Tourism Skills Board (HTSB), identified national level skill standards for eight front-line positions in foodservice and lodging. The standards for each position are contained in eight free-standing documents called skill standards sets. The sets are available in hard copy and in disk versions. Each set contains: methodology, benefits, position snapshot, duties and tasks, criteria for outstanding, performance, competencies, knowledge and skills, and sample training and resource materials.

Description of companion document: Published in the summer of 1995, Building Skills By Building Alliances is a 32-page stakeholder report that provides specific information about the hospitality and tourism skill standards initiative derived from the Goals 2000: Educate America Act. The report explains the development process of the standards, and describes the benefits of the standards for employers, employees, educators and trainers. The report contains sample excerpts of the standards from the front desk clerk and server positions, including a narrative snapshot for each position.

Excerpt(s) of a standard: **Task:** Verify a guest's credit.

Action: Must be able to verify guest credit in a timely, courteous manner and in compliance with the property's credit policies.

- Knowledge:**
1. Property procedure for establishing credit to secure room
 2. Procedure for making credit card imprint
 3. Credit card company policy for documenting authorization of credit

- Skills:**
1. Public speaking (one-to-one)
 2. Arithmetic--multiplication level 1

Partners:

Accrediting Commission of the American Culinary Federation, Alpena High School (MI), American Hotel and Motel Association, American School Food Service Association, American Society of Travel Agents, Applebee's, Canadian Food Service Executives Association, Canadian Tourism H.R. Council, Career College Association, Council of Hotel and Restaurant Trainers, Council on Hotel, Restaurant and Institutional Education, Days Inn, Dietary Managers Association, Educational Foundation of the National Restaurant Association, Educational Institute of the American Hotel and Motel Association, Educational Leadership Institute, Foodservice Consultants Society International, Hotel and Restaurant Employees Union International, IACVB, Inflight Food Service Association, International Association of Conference Centers, International Association of Hospital Accountants, International Foodservice Distributors Association, International Foodservice Executives Association, International Foodservice Manufacturers Association, International Society of Hospital Consultants, InterAmerican Development Bank, J. Sargeant Reynolds Community College, Marriott International, Inc., McDonald's Corporation, NACUFS, National Academy Foundation, National Association of Food Equipment Manufacturers, National Association of Concessionaires, National Exec. Housekeepers Association, National License Beverage Association, National Club Association, National Association of Catering Executives, National Association of State Directors of Technical Education, National Council of Chain Restaurants, National Restaurant Association, National Tour Association, National Urban League, Inc.; Employment and Job Training, OK Department of Vocational and Technical Education, Opryland Hotel, Presley Tours, Inc., Professional Association of Innkeepers International, Provenant Health Partner, Society for Foodservice Management, State Association of Vocational Technical Education (HI), TGIFriday's, The Educational Foundation of the National Restaurant Association, The Greening Group, The Johns Hopkins University Institute for Policy Studies, TIPS, Health Communications, Inc., Tourism Works for America Council, Travel and Tourism Government Affairs, Travel and Tourism Research Association, Tropicana Hotel and Casino,, University of Delaware,

University of Houston, Hilton College of H.R.M., University of MS,
National Food Service Management Inst., Walt Disney World
Company, Woods House, and the U.S. Department of Labor.

HUMAN SERVICES

Human Services Research Institute (HSRI)
2336 Massachusetts Avenue
Cambridge, Massachusetts 02140
Marianne Taylor/Ralph Warren
617-876-0426
617-492-7401 (fax)
marianne@hsri.org

Project Period: 15 June 1993-14 June 1996

Federal Funding Source: Department of Education

Federal: \$1,088,612

Non-Federal: 1,111,525

Total: \$2,200,137

Occupational Area(s): Entry and mid-level human service occupations (encompasses case managers, job coaches and residential support staff)

Status: Draft standards were published in July 1995. The final version of the standards will be published in March 1996.

Description of standards document: The standards identify the skills, behaviors, and knowledge that entry and mid-level human services workers throughout the country use in their jobs. These voluntary standards will provide a foundation to create or improve educational and training programs for the human services worker and to enhance career pathways by fostering the development of competency-based certificate programs.

Workers must know how to work with consumers and families to weave together a vast array of community resources, specialized assistance, and natural supports to promote well-being, empowerment, and community membership.

Description of companion document: The guide to implementing the Community Support Skill Standards will provide helpful guidelines and resources useful to educators, and trainers in adapting existing curricula or building new curricula based on the skill standards. Observations and examples derived from the experiences of educators and trainers currently using the standards in implementation demonstrations will be included.

Excerpt(s) of a standard: **1A. Skill Standard:** The competent community-based human service practitioner assists and supports the participant to develop

strategies, make informed choices, follow through on responsibilities, and take risks.

1Aa. Activity: The competent practitioner assists the participant to identify alternatives when faced with the need to make a decision.

1Aa1. Performance Indicator: The participant reports that the practitioner has helped him or her identify alternatives when making a decision.

Partners:

National Association of State Directors of Vocational Technical Education Consortium, ARC/CCD Governmental Affairs Office, ARC National Headquarters, American Association of Community Colleges, Service Employees International Union, National Assembly of Voluntary Health and Social Welfare Organizations, Inc., Education Development Center, Northern Essex Community College, American Network of Community Options & Resources, Brookdale Community College National Organization for Human Services Education, National Association of State Directors of Developmental Disabilities Services, Inc., National Association of Alcohol and Drug Addiction Counselor Certification Commission, International Association of Psychosocial rehabilitation Services, National Vocational Technical Education Foundation, The Child Welfare League, Responsive Technologies.

INDUSTRIAL LAUNDRY

Uniform and Textile Service Association (UTSA)
1300 North 17th Street
Suite 750
Arlington, Virginia 22209
David Dunlap
703-247-2608
703-841-4750 (fax)

Project Period: 1 December 1992-30 November 1995

Federal Funding Source: Department of Labor

Federal: \$372,416

Non-Federal: 373,663

Total: \$746,079

Occupational Area(s): Production worker and maintenance technician

Status: Standards were published in February 1995.

Description of standards document: There are two levels of certification, Basic Competency and Mastery. These are distinguished by more difficult work activities performed competently in the six functional areas which define the job. These areas are: soil receiving/sorting; cleansing, extraction, and drying/conditioning; pressing and finishing; assembly, segregation, and shipping; stockroom; and repair. The standards include work activities statements, a "skill check" (a notation indicating whether or not a hands-on demonstration of competency is available), essential skills and knowledge, evidence of successful performance criteria and assessment strategies.

Description of companion document: UTSA has completed written and performance assessment guides, competency achievement records for individual workers, and administrators' guide, an employee selection guide, and learning resource modules.

Excerpt(s) of a standard: **Functional Area:** Soil receiving/sorting

Work Segment (Function): Receive and sort/classify soiled goods

Work Activity: Sort soiled goods by route/account number or code.

Essential Skills/Knowledge: Match, compare, count numbers, and/or transfer numbers or sequences of numbers from one source to another source.

Partners:

The stakeholder coalition includes: 1) an advisory council representing the AFL-CIO Laundry and Dry Cleaning International Union, National Education Association, National Institute for Work and Learning, Government of the District of Columbia (Department of Employment Services), American Association of Community Colleges, JTPA Private Industry Council (Washington, D.C.), Responsive Vocational Education, and Accrediting Council for Continuing Education and Training; and 2) a management-level task force representing nine UTSA member companies. In addition, worker panels provide expertise and input as needed. Project support is provided by the Marshall Institute, Inc., of Raleigh, North Carolina, and the U.S. Department of Labor.

METALWORKING

National Institute for Metalworking Skills (NIMS)
2209 Hunter Mill Road
Vienna, Virginia 22181
Robert Sherman
703-255-5886
703-938-4342 (fax)

Project Period: 1 December 1992-30 September 1995

Federal Funding Source: Department of Labor

Federal: \$632,300

Non-Federal: 735,000

Total: \$1,367,300

Occupational Area(s): Metalworking Industry, Machining Skills Level I, Level II and Level III, Metalforming Stamping Level II and Level III, Metalforming Spinning Level II, Metalforming Roll Forming Level II

Status: Machining standards for all three levels were published in April 1995. Metalforming standards were adopted in September 1995 and were published in December 1995.

Description of standards document: The standards follow the same format. For example, Machining-Level I includes seven occupational duty areas with subcategories (duty titles). The duty areas for the Machining I standards include: Job Planning and Management; Job Execution; Quality Control and Inspection; Process Adjustment and Improvement; General Maintenance; Industrial Safety and Environmental Protection; and Career Management and Employment Relations. The standards also include seven knowledge, skills, abilities, and other characteristics needed (KSAOs) to perform the duties. For the Level I Machining Standards, these KSAOs include: Written and Oral Communications; Mathematics; Decision Making and Problem Solving; Social Skills and Personal Qualities; Engineering Drawings and Sketches; Measurement and Metalworking Theory.

Description of companion document: The metalworking industry has adopted the Level I Machining Skills Proficiencies as a prerequisite to qualification for all other metalworking skill standards. All metalworking skill standards use the Machinery's Handbook as a reference guide and as a resource for tables that are used in mathematical calculations.

Testing and certification programs and study guides are additional companion documents.

Excerpt(s) of a standard: Set up and operate a horizontal or vertical milling machine using power feeds. Perform routine milling.

Mastery Performance: Given raw material, process plan, blueprint, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the blueprint specifications. The part specified should require squaring up from the raw state, and should require significant material removal. Depth of cuts between .200" and .250" will be required.

Accuracy level: +/- .015 on all fractions, +/- .005 on all decimals unless otherwise specified on the blueprint. Surfaces square to within +/- .005" over 4".

Partners: Association for Manufacturing Technology, Council of Great Lakes Governors, Human Resource Development Institute of the AFL-CIO, International Association of Machinists and Aerospace Workers, National Screw Machine Products Association, National Tooling and Machining Association, Precision Metalforming Association, Tooling and Manufacturing Association, and the U.S. Department of Labor.

PHOTONICS

Center for Occupational Research and Development (CORD)

601 Lake Air Drive

Waco, Texas 76710

Darrell Hull

817-772-8756

817-772-8972 (fax)

dhull@cord.org

Project Period: 1 May 1993-31 October 1996

Federal Funding Source: Department of Education

Federal: \$511,680

Non-Federal: 512,740

Total: \$1,024,420

Occupational Area(s): Photonics Technicians (encompasses the following specialties: Defense/Public Safety/Aerospace, Medicine, Computers, Communications, Manufacturing/Test and Analysis and Environmental/Energy/Transportation)

Status: Standards were published in March 1995.

Description of standards document: National Photonics Skill Standard for Technicians includes a collection of validated task statements, which represents the common tasks all photonics technicians should be able to perform. The standards are intended to define the knowledge, capabilities and skills workers in the photonics industry should have. Those skills and knowledge areas include core academic subjects such as applied mathematics, physics, chemistry, and biology; as well as electronics, computer science, fiber optics, laser technology, materials processing, vacuum technology, detection and measurement, circuitry, technical writing, and many others. The standards document also provides curriculum guidance to high schools, community colleges and universities that are creating or augmenting photonics programs to meet industrial needs.

Description of companion document: Photonics School-to-Work Implementation Guide will be designed to help secondary educators and administrators prepare high school students for entry into a postsecondary photonics program. The book will highlight the necessary curriculum, but the main focus would be on building partnerships. Included will be information on initiating, establishing and maintaining partnerships with businesses and vocational institutions that deal with photonics. The guide will also cover the topic of certification. In its closing, the guide will list contacts

in business and education that are willing to assist schools in the partnership endeavor.

Postsecondary Photonics Programs will outline the necessary components for a certifiable photonics program. Teacher and student qualifications, curricula, laboratories and articulation are the main topics to be covered. The final segment of the book will acknowledge outstanding photonics technician programs across the country. These will be chosen through submission of miniproposals and from the results of a survey.

To help make photonics programs more instructor friendly, the Photonics Technical References, Curriculum Design and Teachers' Assistance will provide valuable information on teaching resources for educators. The guide will not only be for educators, but partly by educators. Through survey and data collection sheets, current references used by instructors across the country will be listed in the guide. Authors of the references will be encouraged to submit summaries or abstracts of their materials. Laboratory equipment suppliers will be listed, as will possible funding sources for programs, curricula and equipment. The booklet will also discuss faculty training and development.

By expanding on the six occupational areas listed in the photonics standard, Employment in Photonics will be a useful resource for students and educators. It will cover three areas of the job hunt: What and where are the jobs? What are the necessary qualifications? Where can training be obtained? The book will also be a forum for professional societies to tell what they are about and what they offer. Accompanying the guide will be a video on careers in photonics.

Excerpt(s) of a standard: **Lasers--Diode:** Analyze, assess, evaluate, examine, clean, maintain, align, mount, install, operate, demonstrate, select, specify, and purchase diode lasers.

Detectors--Semiconductors: Calibrate, clean, maintain, align, mount, install, operate, and demonstrate semiconductor detectors.

Partners: ITC, AT&T Bell Labs, Golden Aspen, ACS, TRW, Thoughtventions Unlimited, Hughes Danbury Optical Systems, Babcock & Wilcox, OZ Optics Limited, Lightguide Engineering Co, Hughes JVC-Tech. Corp., Melles Griot, Opticomm Corp., Adept Technology, Micro Electric Research Center, OIDA, Omnichrome Inc., Teledyne Brown Engineering, York Helicopter, Accuwave, Unitek Equipment Inc., Medical Optics, Corning, Mound Applied Technologies, Summers & Laboratories, Evergreen Laser Corp., Chiron Vision, SEA Inc., Cedars-Sinai Medical Center, Hughes Aerospace and Electronics, Ball Aerospace Systems, Litton Guidance and Control Systems, Laser Institute of America, NDC Systems, Union Carbide Crystal Products,

EO Technologies, Wilcox Electric Inc., Allied Science Inc., Litton-Airtron Systems, Vital Ind., Asea Brown Boveri Ltd., Ed Doc Jamback Inc., The Light Brigade, Proformix, Cambridge Technology Inc., Rocketdyne, GTE Labs, UVP Inc., Physical Optics Corp., Polygon Industries, FAA Technical Center, University of Texas at Arlington, Nichols Research Corp., Education and Training Support Agency, Allied Signal, GEOMAP, Jenovation Opto-Electronics, TASC, Laser Science Inc., Wausau Medical Center, CBN, Photonics Systems Inc., America Network, GM Hughes Electronics, Aerojet Electronics Systems Plant, Picometrix Inc., Magnavox Electronic Systems, General Dynamics, Armstrong Lab, MM&R International, Cyberonics, Optronic Labs, Jet Propulsion Lab, Interserv Corp., IOLAB Corp., The Aerospace Corp., Graseby Optronics, Optovac, Escantech, Pearson Technical Services, Polyscan Inc., Pach & Co., Metrics Research, Prince Corp., SAIC, Gentec Corp., Granit Corp., Laser Power Research, Hughes Aircraft Co., Tech Plus, ASL Spectra Diagnostics, RCS Technologies, Aerovision Systems, WYCO, Army Research Lab, Lawrence Berkeley Lab, Westmoreland Community College, Cincinnati Technical College, Hennepin Technical College, Indian Hills Community College, Cornell University, Shoals Community College, Sinclair Community College, Christopher Newport University, San Diego City College, North Lake College, Alabama A&M University, Idaho State University, University of Arizona, Queensborough Community College of New York, Hudson Valley Community College, University of Central Florida, TSTC Harlingen, Moorpark College, Pima College--East Campus, Haywood Technical College, Edison Community College, University of Colorado at Boulder, University of Delaware, Florida A&M University, Northwest Community College, Bucholz High School, Oregon Institute of Technology, Camden County College, Rochester Institute of Technology, Pasadena City College, Central Carolina Technical College, Madisonville Community College, Southwestern College, Southeast Community College, Springfield Technical Community College, Maxine Waters EPC, University of New Mexico, C&H Engineering, Texas State Technical Institute, Massachusetts Bay Community College, Ventura College, SUNY Institute of Technology, University of Houston-Clearlake, University of Connecticut, Northcentral Technical College, Northern New Mexico Community College, Indiana Vocational Technical College, California State University-Long Beach, Vincennes University, SDLI, ITT Technical, Lyman High School.

PRINTING

Graphic Arts Technical Foundation (GATF)
4615 Forbes Avenue
Pittsburgh, Pennsylvania 15213-3796
Jack Simich
412-621-6941
412-621-3049 (fax)

Project Period: 1 October 1992-30 December 1995

Federal Funding Source: Department of Education

Federal: \$1,049,321

Non-Federal: 1,309,974

Total: \$2,359,295

Occupational Area(s): Prepress/Imaging, Press/Printing and Finishing/Distribution

Status: Draft Imaging (Prepress) standards were published in May 1995. Draft Press standards were published in May 1995. Final standards for both of these areas were published in October 1995. Draft Finishing/Distribution (Postpress) standards were published in September 1995. Final Finishing and Distribution standards were published in January 1996.

Description of standards document: The Imaging standards have been divided into a series of functions that include what a person needs to know and be able to do in the areas of Job Engineering, Image Acquisition, Assembly, Output, and Technical Services. Foundation skills are included.

The Press standards include lithographic sheetfed press and web press functions. The activities under each function are identified, which include the knowledge and operations required to perform the function. It also includes a section on foundation skills.

The Finishing/Distribution standards have been divided into a series of functions that cover the range of activities and knowledge areas for Binding Operations, Specialty Operations, Mailing and Distribution Operations, and Foundation skills.

Note: All these documents include information about the national skill standards movement, and a profile of the industry including overview, employment and industry trends related to each area. Details regarding the development and validation process are reported in each document.

Description of companion document: Not applicable.

Excerpt(s) of a standard: The expert press operator should be able to:

Competency: Understand the purpose of ink additives and be able to use appropriately.

Performance Level: List ink additives and their properties and is able to use ink additives appropriately as job requires; is able to solve problems with additives as they develop.

Partners:

Castle Press, DeLancey Printing, Defense Printing Service, R.R. Donnelley and Sons, Fleet Graphics, Hart Graphics, Impressions Incorporated, Inland Lithograph, Lehigh Press Colortronics, McArdle Printing, Obenchain Printing, Quad Graphics, Quebecor, Rono Graphics, Solar Press, Trese Printing, Walton Press, Graphic Communications International Union (national organization and several locals), California Polytechnic State University, Rochester Institute of Technology, Cincinnati Technical College, Fullerton, Warren Occupational Technical Center, Gordon Cooper Area Vocational School, Graphic Arts Institute of St. Louis, Association for Graphics Arts Training, Education Council of the Graphic Arts Industry, International Graphic Arts Education Association, Graphics Arts Technical Foundation, International Association of Printing House Craftsmen, International Prepress Association, National Association of Printers and Lithographers, National Association of Quick Printers, The Association for Suppliers of Printing and Publishing Technologies, Printing Industries of America and several PIA locals, Research and Engineering Council of the Graphic Arts Industry, California Business Roundtable, Council of Great Lakes Governors, Jobs for the Future, Graphic Arts Employers, Master Printers Association, New England Board of Higher Education, State of Wisconsin Department of Education.

RETAIL TRADE

National Retail Federation (NRF)
Liberty Place
325 7th Street, NW
Suite 1000
Washington, DC 20004
Robert Hall/Kathy Mannes
202-783-7971
202-737-2849 (fax)

Project Period: 1 December 1992-31 December 1995

Federal Funding Source: Department of Labor

Federal: \$701,115

Non-Federal: 716,325

Total: \$1,417,440

Occupational Area(s): Professional Sales Associate

Status: Standards were published in October 1994.

Description of standards document: The standards document includes an initial statement as to skill levels a Professional Sales Associate will need in selected generic skills. These standards identify a level of performance associated with key foundation skills and incorporate workplace skills identified in the SCANS Report issued by the U.S. Department of Labor in 1992. A description of the Work Keys System, developed by American College Testing (ACT), was used to profile these basic skills and determine appropriate levels for Professional Sales Associate. The standards document also lists underpinning personal qualities desirable in the retail workplace. An assessment and implementation guide is being developed which will detail the performance indicators. These indicators will provide the basis for determining when and how a task is effectively performed. Standards are being piloted in conjunction with state and local education projects, with retail companies, and with DECA, the student marketing association.

Description of companion document: Company Guide for implementing standards, with applications for training, recruiting, assessment and certification.

Excerpt(s) of a standard: Determine customer's needs by listening and asking questions.

Partners: The partners include: J.C. Penney Company, Nordstrom, Lord & Taylor, Metropolitan Apparel Group, Woolworth Corporation, Crate &

Barrel, Federated Department Stores, National Shoe Retailers' Association, Parisian, Tandy Corporation, United Food and Commercial Workers International Union, University of Hartford, Delaware Department of Public Instruction Training and Development Corporation, American College Testing and DECA, and the U.S. Department of Labor.

WELDING

American Welding Society (AWS)
550 NW LeJeune Road
Miami, Florida 33126
Nelson Wall/Robert Reeve
305-443-9353
305-443-7559 (fax)

Project Period: 5 July 1993-4 July 1996

Federal Funding Source: Department of Education

Federal: \$1,059,626
Non-Federal: 1,383,764
Total: \$2,443,390

Occupational Area(s): Entry Level Welder (a semi-skilled, production worker requiring significant supervision)

Status: Standards were published in March 1995. Standards are currently being written for Entry Level Welder II and Entry Level Welder III.

Description of standards document: Specification for the Qualification and Certification for Entry Level Welders established the basis for administering the entry level welder program and defines certification requirements.

Description of companion document: Guide for the Training and Qualification of Welding Personnel--Entry Level Welders is a curriculum guide containing learning objectives, performance conditions, desired behavior, evaluation criteria and learning activities necessary to accomplish training as a participating organization under the Entry Level Welder Program.

Excerpt(s) of a standard: **Learning Objective:** Perform straight cutting operations on plain carbon steel, using the manual oxyfuel gas cutting process.

Performance Conditions: Provided with a period of instruction and demonstration, protective clothing and equipment, manual oxyfuel gas cutting equipment, accessories, oxygen/fuel gas supply systems and accessories, hand tools, base metal and a cutting assignment, in the work area.

Desired Behavior: The trainee will make straight cuts on plain carbon steel.

Evaluation Criteria: The trainee produces a straight production cut surface. During and after each operation cut surfaces are visually examined by the welder and accepted by the instructor. The objective is performed on a routine basis during the length of the program. In accordance with the requirements of AWS QC10, the trainee shall pass the drawing interpretation and cutting elements of workmanship qualifications for visual examination.

Learning Activities: The instructor shall:

1. Provide demonstrations related to straight cutting operations using manual oxyfuel gas cutting equipment.
2. Provide instruction related to visual examination of flame cut edges and surfaces.
3. Provide training exercises related to straight cutting operations on plain carbon steel, using manual oxyfuel gas cutting equipment.
4. Observe trainee following safe oxyfuel gas cutting practices.
5. Observe trainee operating manual oxyfuel gas cutting equipment.
6. Visually inspect trainee's workmanship samples.
7. Provide instruction in cutting procedures related to this learning objective.
8. Prepare trainee for the fabrication, elements of workmanship qualifications for visual examination and bend testing.
9. Keep training records reflecting results of straight cutting and workmanship qualification for visual examination.

Partners:

The ESAB Group, Inc., Pacific Northwest Ironworkers, The Ohio State University, Miller Electric Manufacturing Company, Moraine Valley Community College, Ingalls Shipbuilding, H&M Steel, Inc., Valmet Paper Machinery, National Training Fund, Oak Ridge National Laboratory, Dresser-Rand, Inc., Welding Engineering Supply Company, and NWF Consultants.

Part II

Skill Standards Matrix

SKILL STANDARDS PILOT PROJECTS MATRIX

INDUSTRY AND LEAD ORGANIZATION	STATUS*	CERTIFICATION LEVEL(S)	NUMBER OF OCCUPATIONS AND OCCUPATIONAL AREAS	PLANNED COMPANION DOCUMENT(S)	FEDERAL AND NONFEDERAL FUNDS	EDUCATION LEVEL	JOB ANALYSIS METHOD
ADVANCED HIGH PERFORMANCE MANUFACTURING National Coalition for Advanced Manufacturing (NACFAM)	Final skill Set Issued; Standards in progress	Entry and fully competent	1 Technical Workers	Implementation tools and guides for certification and documentation	Federal \$889,582 NonFederal 1,056,091 TOTAL \$1,945,673	Secondary Postsecondary Adult	Modified DACUM
AGRICULTURAL BIOTECHNOLOGY National FFA Foundation	Final	Entry	1 Agricultural Biotechnology Technician	Implementation Guide	Federal \$998,059 NonFederal 1,047,895 TOTAL \$2,045,954	Secondary Postsecondary Adult	Modified DACUM
AIR CONDITION HEATING AND REFRIGERATION Vocational Technical Consortium of States (V-TECS)	Final	Entry through Journeyman	3 Air-Conditioning, Heating, and Refrigeration Technicians in residential and commercial environments	Occupational Analysis	Federal \$606,140 NonFederal 653,070 TOTAL \$1,259,210	Secondary Postsecondary Adult	V-TECS
AUTOMOBILE, AUTOBODY, AND MEDIUM TRUCK TECHNICIAN National Automotive Technicians Education Foundation (NATEF)	Final	Training Program Certification for Entry Level Technician	3 Entry -Level Automobile, Autobody, and Medium/Heavy Truck Technicians	Extensive Applied Academic & Workplace Skills Book	Federal \$ 995,007 NonFederal 995,007 TOTAL \$1,990,014	Secondary Postsecondary Adult	Modified DACUM

INDUSTRY AND LEAD ORGANIZATION	STATUS*	CERTIFICATION LEVEL(S)	NUMBER OF OCCUPATIONS AND OCCUPATIONAL AREAS	PLANNED COMPANION DOCUMENT(S)	FEDERAL AND NONFEDERAL FUNDS	EDUCATION LEVEL	JOB ANALYSIS METHOD
BIOSCIENCE Education Development Center (EDC)	Final	Entry	1 (comprising 20 related occupations) Beginning-Level Bioscience Technical Specialists	Training Guidebook & Directory	Federal \$1,074,922 Non Federal \$1,114,955 TOTAL \$2,189,877	Secondary Postsecondary Adult	Modified DACUM
CHEMICAL PROCESS INDUSTRIES American Chemical Society	Draft	Entry	2 Entry Level Chemical Laboratory Technicians and Process Technical Operators	Master Training Resource Catalog	Federal \$1,098,310 NonFederal \$1,111,731 TOTAL \$2,210,041	Secondary Postsecondary Adult	Modified DACUM
COMPUTER AIDED DRAFTING AND DESIGN (CADD) National Coalition for Advanced Manufacturing (NACFAM)	Final	Entry	Many occupations involving design or manufacture of a product	Measurability supplement and CADD exam	Federal \$1,096,683 Non Federal \$1,416,717 TOTAL \$2,513,400	Secondary Postsecondary Adult	Not Labeled
ELECTRICAL CONSTRUCTION National Electrical Contractors Association	Final for Construc. Worker. Electrical Residential and Electrical Line Construc. Worker in progress	Journeyman	3 Electrical Construction Worker, Electrical Line Construction Worker, and Electrical Residential Construction Worker	Curriculum Guide for Curriculum Planners and Trainers	Federal \$12,000 NonFederal \$695,000 TOTAL \$707,000	Secondary Postsecondary	Modified DACUM

INDUSTRY AND LEAD ORGANIZATION	STATUS*	CERTIFICATION LEVEL(S)	NUMBER OF OCCUPATIONS AND OCCUPATIONAL AREAS	PLANNED COMPANION DOCUMENT(S)	FEDERAL AND NONFEDERAL FUNDS	EDUCATION LEVEL	JOB ANALYSIS METHOD
ELECTRONICS (Dept. of Education) Electronics Industries Foundation (EIF)	Final	Entry	11 Entry-Level Electronics Technician employed in basic and applied research; product development; manufacturing; marketing; maintenance; and repair of electronic components, devices, and systems	Measurement Criteria & Study of Certification & Accreditation Programs	Federal \$1,091,233 Non Federal \$1,091,317 TOTAL \$2,182,550	Secondary Postsecondary Adult	Modified DACUM
ELECTRONICS (Dept. of Labor) American Electronics Association (AEA)	Final	Entry through Expert	4 Manufacturing Specialist, Manufacturing Specialist Team Leader, Administrative/ Information Services Support, and Pre/Post Sales	Assessment and Certification Research Agenda	Federal \$1,062,364 NonFederal \$4,150,500 TOTAL \$5,212,864	Secondary Postsecondary Adult	Modified DACUM
GROCERY Grocers Research and Education	Draft	Entry	3 Customer Service/Stock Associate and Front-End Associate (all-entry level positions)	Video	Federal \$437,300 NonFederal \$530,083 TOTAL \$967,383	Secondary Postsecondary Adult	Modified DACUM

INDUSTRY AND LEAD ORGANIZATION	STATUS*	CERTIFICATION LEVEL(S)	NUMBER OF OCCUPATIONS AND OCCUPATIONAL AREAS	PLANNED COMPANION DOCUMENT(S)	FEDERAL AND NONFEDERAL FUNDS	EDUCATION LEVEL	JOB ANALYSIS METHOD
HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Center of Occupational Research and Development (CORD)	Final	Entry	1 Entry-Level Hazardous Materials Management Technician Encompasses several job titles	Supplement containing industrial scenario, occupational levels, assessment techniques and curriculum guide	Federal \$513,800 NonFederal \$513,900 TOTAL \$1,027,700	Postsecondary Adult	A team comprised of 10 people developed the first task document. HazMat technicians were asked to maintain a log of their work. The results from the first third to half were used to amend the first task document. Advisory Panel validated. (IEL, 1996).
HEALTH CARE Far West Laboratory for Educational Research and Development	Final	Entry/Technical	5 Clusters Health Care Core (all workers in health services) and 4 occupational clusters; therapeutic, diagnostic, information services, and environmental services	Assessment Prototypes	Federal \$1,020,156 Non Federal \$1,062,612 TOTAL \$2,082,768	Secondary Postsecondary Adult	Modified DACUM
HEAVY HIGHWAY CONSTRUCTION AND ENVIRONMENTAL REMEDIATION Laborers-AGC Education and Training Fund	Draft	Basic and Mastery	4 Pipe laying Work, Concrete Work, Lead Remediation, and Petroleum Chemical Remediation	Certification Program	Federal \$380,480 NonFederal \$380,575 TOTAL \$761,055	Postsecondary Adult	Modified DACUM
HOSPITALITY AND TOURISM Council on Hotel, Restaurant and Institutional Education (CHRIE)	Final	NA	8 Front-Line Positions in Lodging (Front Desk Associate, Reservationist, Bellstand, and Concierge) and in Food (Server, Host, Cashier, and Busser)	Training Performance Appraisal	Federal \$999,775 NonFederal \$1,884,292 TOTAL \$2,884,067	Secondary Postsecondary	Modified DACUM

INDUSTRY AND LEAD ORGANIZATION	STATUS*	CERTIFICATION LEVEL(S)	NUMBER OF OCCUPATIONS AND OCCUPATIONAL AREAS	PLANNED COMPANION DOCUMENT(S)	FEDERAL AND NONFEDERAL FUNDS	EDUCATION LEVEL	JOB ANALYSIS METHOD
HUMAN SERVICES Human Services Research Institute (HSRI)	Final	Entry and Mid	Clusters - encompasses case managers, job coaches and residential support staff	Curriculum Guide Resource Document	Federal \$1,088,612 NonFederal \$1,111,525 TOTAL \$2,200,137	Pre-College	Modified DACUM
INDUSTRIAL LAUNDRY Uniform and Textile Service Association (UTSA)	Final	Basic and Mastery	2 Production Worker and Maintenance technician	Certification Guideline, Administrators guide, employers preemployment and selection guide, and Learning resource modules	Federal \$372,416 NonFederal \$373,663 TOTAL \$746,079	Secondary Postsecondary Adult	Modified DACUM
METAL WORKING National Institute for Metalworking (NIMS)	Final	I,II,III	8 Machining, Industrial Equipment, Tooling and Metalforming Technicians	Machinery Handbook, Testing and Certification Program and Study Guide	Federal \$632,300 NonFederal \$735,000 TOTAL \$1,367,300	Secondary Postsecondary Adult	Modified DACUM
PHOTONICS Center for Occupational Research and Development (CORD)	Final	Entry	9 Photonics Technicians including specialty areas such as defense/public safety, medicine, and communications	School-to-Work implementation guide, post-secondary program, teachers' assistance and curriculum design, and employment in the field	Federal \$511,680 NonFederal \$512,740 TOTAL \$1,024,420	Secondary Postsecondary Adult	CORD used a set of grids with industries. The top grid had verbs and the left side listed tools and equipments. They asked industry which grids were important. They ended with 60 tools and various verbs. (IEL, 1996)

INDUSTRY AND LEAD ORGANIZATION	STATUS*	CERTIFICATION LEVEL(S)	NUMBER OF OCCUPATIONS AND OCCUPATIONAL AREAS	PLANNED COMPANION DOCUMENT(S)	FEDERAL AND NONFEDERAL FUNDS	EDUCATION LEVEL	JOB ANALYSIS METHOD
PRINTING Graphics Arts Technical Foundation (GATF)	Final	Expert	3 Pre-Press Imaging, Press and binding, Finishing, and Distributing Several occupations within an area	Not Applicable	Federal \$1,049,321 NonFederal \$1,309,974 TOTAL \$2,359,295	Secondary Postsecondary Adult	Modified DACUM
RETAIL TRADE National Retail Federation (NRF)	Final	Entry	1 Professional Sales Associate	Assessment and Implementation Guide	Federal \$701,115 NonFederal \$716,325 TOTAL \$1,417,440		Modified DACUM
WELDING American Welding Society (AWS)	Final for Level I, Level II & III in progress	Entry, Master and Expert	1 Entry-Level Welder (semiskilled production worker requiring significant supervision)	Video, Curriculum Guide Power Course	Federal \$1,059,626 NonFederal \$1,383,764 TOTAL \$2,443,390	Secondary Postsecondary Adult	Modified DACUM
TOTAL					Federal \$17,691,077 Non Federal \$23,846,540 \$41,537,617		

This skill standard matrix depicts the following: if the standards are in draft or final form; the number of occupations for which standards are being developed by each project; companion document(s), such as assessment and certification procedures, and training guidebook; federal and nonfederal funds (50 percent match for ED projects and a 100 percent match for DOL), the level of education for which standards are targeted and the job analysis method used.

*NOTE - These standards are in final form in terms of the grant requirement; they will continuously be updated to meet the needs of their industry.

** Job analysis method used to develop and validate skill standards. Most of the projects used the DACUM (Designing a Curriculum) or modified DACUM. The DACUM process for occupational analysis involves expert workers who describe what they do and how they do it. Modified DACUM process varied among the Pilots. Some added focus groups to understand future industry trends. (Institute for Educational Leadership, 1996)

Part III

Project Directory

United States Departments of Education and Labor Occupational Skill Standards Project Directory 1996

CALIFORNIA

Sri Ananda
Far West Lab for Educational Research
and Development
730 Harrison Street
San Francisco, CA 94107-1242
(415) 241-2712

Industry: Health Care

Cheryl Fields Tyler
American Electronics Association
5201 Great American Parkway
Box 54990
Santa Clara, CA 95056
800-284-4232

Industry: Electronics (DOL)

CONNECTICUT

John Tippie/James Warren
Laborers-AGC Education and Training Fund
P.O. Box 37
37 Deerfield Road
Pomfret Center, CT 06259
(203) 974-0800

Industry: Heavy Highway/Construction and
Environmental Remediation

DISTRICT OF COLUMBIA

Kenneth M. Chapman
American Chemical Society
1155 Sixteenth Street, NW
Washington, D.C. 20036
(202) 872-8734

Industry: Chemical Process

DISTRICT OF COLUMBIA (cont'd)

Doug Adair/Laura Pfalzer/Joe Ryan
Council on Hotel, Restaurant and
Institutional Education
1200 17th Street, NW
Washington, D.C. 20036-3097
(202) 331-5990

Industry: Hospitality and Tourism (DOL)

Irwin Kaplan/Molly Mannon
Electronics Industries Foundation
919 18th Street, NW
Suite 900
Washington, D.C. 20006
(202) 955-5823

Industry: Electronics

Jane Beardsworth
National Coalition for Advanced Manufacturing
1331 Pennsylvania Avenue, NW
Suite 1410, North
Washington, D.C. 20004-1703
(202) 662-8960

Industry: Computer Aided Drafting and Design

C. J. Shroll
National Coalition for Advanced Manufacturing
1331 Pennsylvania Avenue, NW
Suite 1410, North
Washington, D.C. 20004-1703
(202) 662-8968

Industry: Advanced Manufacturing

Robert Hall/Kathy Mannes
National Retail Federation
Liberty Place
325 7th Street, NW, Suite 1000
Washington, D.C. 20004
(202) 783-7971

Industry: Retail Trade (DOL)

FLORIDA

Nelson C. Wall/Robert Reeve

American Welding Society
550 NW LeJeune Road
Miami, FL 33126
(305) 443-9353
Industry: Welding

GEORGIA

Victor Harville/Ronald McCage
V-TECS, Southern Association of Colleges
and Schools
1866 Southern Lane
Decatur, GA 30033-4097
800-248-7701
Industry: Air-Conditioning, Heating,
and Refrigeration

MARYLAND

Charles Kelly
National Electrical Contractors
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814-5372
(301) 657-3110
Industry: Electrical Construction (DOL)

Robert Sherman
National Institute for Metalworking Skills (NIMS)
2209 Hunter Mill Road
Vienna, Virginia 22181
703-255-5886
Industry: Metalworking (DOL)

MASSACHUSETTS

Judith Leff/Monika Aring
Education Development Center
55 Chapel Street
Newton, MA 02158-1060
(617) 969-7100, ext. 2397
Industry: Bioscience

MASSACHUSETTS (cont'd)

Marianne Taylor/Ralph Warren

Human Services Research Institute
2336 Massachusetts Avenue
Cambridge, MA 02140
(617) 876-0426
Industry: Human Services

PENNSYLVANIA

Jack Simich
Graphic Arts Technical Foundation
4615 Forbes Avenue
Pittsburgh, PA 15213-3796
(412) 621-6941
Industry: Printing

TEXAS

Darrell Hull
Center for Occupational Research
and Development (CORD)
601 Lake Air Drive
Waco, TX 76710
(817) 772-8756
Industry: Photonics

Jim Johnson
Center for Occupational Research
and Development (CORD)
601 Lake Air Drive
Waco, TX 76710
(817) 772-8756
Industry: Hazardous Materials Management

VIRGINIA

Patricia Lundquist
National Automotive Technicians
Education Foundation
13505 Dulles Technology Drive
Suite 2
Herndon, VA 22071-3421
(703) 713-0100
Industry: Automobile, Autobody, and
Truck Technician

VIRGINIA (cont'd)

Gail Hanger/Thomas Zaucha

Grocers Research and Education Foundation
1825 Samuel Morse Drive
Reston, VA 22090
(703) 437-5300
Industry: Grocery

Bernard Staller
National FFA Foundation
P.O. Box 15160
Alexandria, VA 22309-0160
(703) 360-3600 ext. 268
Industry: Agricultural Biotechnology

David Dunlap
Uniform and Textile Service Association
1300 North 17th Street
Suite 750
Rosslyn, Virginia 22209
703-247-2608
Industry: Industrial Laundry (DOL)

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