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ABSTRACT

This handbook contains a competency-based curriculum for teaching industrial education in Alaska. Competencies are listed for the following areas: employability, auto maintenance, building maintenance, commercial fishing, communications, construction, drafting, electronics, energy and power, forestry and logging, graphics, high technology, horticulture, manufacturing, metals, mining and petroleum, small engine maintenance, technological impacts, transportation, wiring and plumbing, and woodworking. The handbook is organized in seven sections. Section 1 presents an introduction to competency-based curriculum, while Section 2 provides assistance in the program development of industrial education course content. Section 3, the core of the curriculum, provides the competencies and tasks for industrial education. Section 4 contains course descriptions to assist school districts in developing their vocational programs. Section 5 contains the curriculum analysis matrix to be used in determining competencies to be included in specific industrial education courses. Section 6 contains a sample skills card to be used in evaluating competency completion by students. Section 7 lists information on resources and materials available in Alaska and throughout the country. (KC)

INDUSTRIAL EDUCATION CURRICULUM

Bill Sheffield, Governor

Developed by the. . .

ALASKA DEPARTMENT OF EDUCATION
Adult and Vocational Education

Marshall L. Lind, Commissioner

Gerald D. Hiley, Director for Vocational Education

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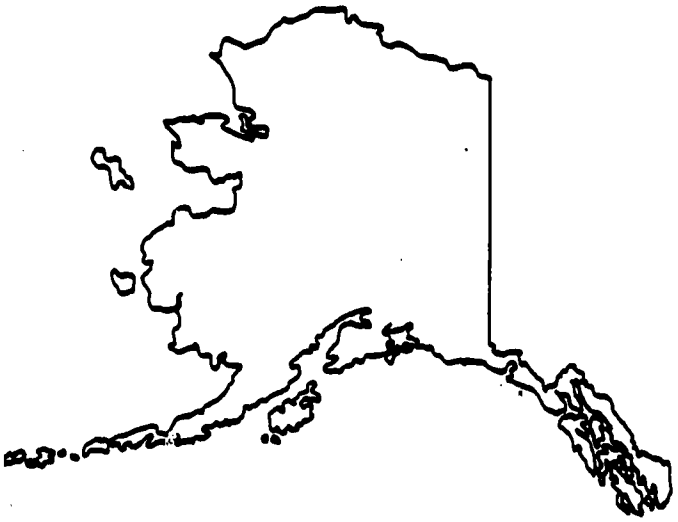

Alaska Department of Education 1986

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Forward

Industrial education deals with industry. Historically, the class often favors some segments of industry over others. The class should not ignore particularities of a locale. Students in a maritime community may spend the entire year studying fishing. Industrial education in Alaska is designed to assist schools in targeting the local and state industries rather than traditional industrial arts which is geared more to manufacturing.

Alaska's economy is more diversified than apparent. The oil and gas industry has had a major impact on economic development and employment in the State and will continue to play an important role in Alaska's future. Fishing, mining, manufacturing--fish processing and timber are also major industries in Alaska. Secondary industries such as transportation, communication and utilities have been and will continue to lead growth in employment. This is due to the trend for more locally provided goods and services than were once provided by firms out-of-state (Alaska Planning Information, Alaska Department of Labor, February 1986).

This industrial education curriculum looks to industries relevant to Alaska. From the more traditional shop class (woods) to the nontraditional (transportation) to the very relevant (mining and petroleum), this handbook seeks to direct industrial education to prepare students for jobs in Alaska, as well as introduce students to new technologies. Just as industry is hardly static and unchanging, this curriculum requires constant updating and revision. The curricula should be a foundation for further study in these disciplines.

This handbook is a competency-based curriculum. During two audioconferences, educators from around the state provided input for completing the draft. A task force of three educators convened to complete the handbook. The competencies and identified units basically came from those utilized in other states with the addition of those deemed integral to industry in Alaska: forestry, logging, mining and petroleum. While horticulture and agronomy are not booming industries in Alaska, gardening and truck farming, as well as the Delta barley project and the "famed" Matanuska Valley, point to viable, valuable contributions from those fields. The horticulture unit concentrates on greenhous

The handbook is organized in seven sections:

Section I presents an introduction to competency-based curriculum. The role of vocational instructors in curriculum planning, implementation and evaluation is also included.

Section II provides assistance in the program development of industrial education course content.

Section III is the core of the curriculum, it provides the competencies and tasks for industrial education.

Section IV contains course descriptions to assist school districts in developing their vocational programs.

Section V contains the curriculum analysis matrix to be used in determining competencies to be included in specific industrial education courses.

Section VI contains a sample skills card to be used in evaluating competency completion by students.

Section VII lists information on resources and specific materials available from a variety of sources in Alaska and throughout the country.

It is recommended that all students participate in career awareness and exploration experiences to help them understand the connection between school and work and make career plans.

Acknowledgements

Special appreciation is expressed to Richard Steele, Carin Smolin and Mike Macy of the South East Regional Resource Center who coordinated the preparation and completion of this handbook, and to Twyla Coughlin, Associate Director of the South East Regional Resource Center who administered this project.

A task force of Alaskan educators helped to define the units, competencies, and tasks included in this handbook. The task force participated in two audioconferences and reviewed drafts mailed to them. The following individuals on the Industrial Education Curriculum Task Force provided guidance and expertise during one or both audioconferences:

Donald L. Bernard
Chugiak High School
Chugiak

David Brown
Wrangell High School
Wrangell

Kenneth L. Cassell
Juneau Douglas High School
Juneau

Will Madison
East High School
Anchorage

Donald B. McCann
Kaltag School
Kaltag

Dale Moon
Kenai Junior High School
Kenai

R. Duane Taylor
Nulato Schools
Nulato

Jeffrey D. Trotter
Palmer High School
Palmer

Walter Ward, Jr.
Soldotna High School
Soldotna

Walter Ward, Sr.
Soldotna High School
Soldotna

A task force met to finalize this handbook. These individuals deserve a great deal of credit for their hard work and valuable input:

Kenneth L. Cassell, Juneau Douglas High School, Juneau
Donald B. McCann, Kaltag School, Kaltag
Walter Ward, Jr., Soldotna High School, Soldotna

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Finally, Verdell Jackson, Curriculum Specialist for the Office of Adult and Vocational Education must be recognized for participating in every step of the handbook's development and ensuring that it is a model Alaskan curriculum of the highest quality.

Karen Ryals
Assistant Administrator for Vocational Education
Office of Adult and Vocational Education
Alaska Department of Education
June 1986

Introduction to Competency-Based Curriculum

Competency-Based Curriculum

Vocational education should be directed toward the skills, knowledge, and attitudes needed for successful employment. Changes in technology are affecting the job requirements in industrial education. Such changes require industrial educators to continually update their curriculum in order to prepare students for competition in the job market.

An effective method for delivering vocational education is through a competency-based curriculum. This curriculum is based on a task analysis of the key occupations in industrial education. Once a competency-based curriculum is set in place, student performance must be measured on levels of proficiency in those competencies. Thus, the critical features of competency-based education are:

1) validating competencies to be included in the curriculum; and
2) evaluation of student competency levels.

This curriculum handbook sets direction for local curriculum developers. It provides a framework for developing courses of study and lesson plans in local schools.

Curriculum Based On Competencies

Competence refers to the adequate performance of a task. The task may be evaluated according to the performance or process, the product, or both.

Competency-Based Vocational Education consists of programs that derive their content from the tasks performed in each occupation/job and assess student performance on the basis of preset performance standards.

Learning materials define the competencies the student is to learn, the criteria by which the student will be evaluated, and the conditions under which the evaluation will occur.

Competency-based instruction places emphasis on the ability to do, as well as on learning how and why. Student performance and knowledge are individually evaluated against the stated criteria, rather than against group norms.

The competency process utilizes a checklist of attitudes, knowledge and skills that are commonly needed by entry level employees in industrial education occupations. In developing this curriculum handbook, a cross-section of professionals were asked to respond to the checklist on the basis of needs within their own establishments. The checklists were tallied and summarized to determine which attitudes, knowledge and skills were common to firms in Alaska. Also, the competencies in each area were ranked as to decreasing importance.

Student Performance Assessment

A curriculum becomes competency-based when students are assessed on the basis of their competence. Sample skill cards are provided in this guide for teachers who wish to use them in assessing the competency levels of their students. The card has four levels of proficiency which allow continued development of skills. The card can be used to monitor students' progress as they move between industrial education classes, between teachers and grade levels and between school and work. The completed skills card is an important part of a placement portfolio when students begin their job searches.

Curriculum Delivery Systems

Vocational Student Leadership Organizations

Some of the competencies in this curriculum guide cannot be fully met in traditional classroom and lab settings. The Vocational Industrial Clubs of America (VICA) is a delivery system which can be integrated into the regular school program. Human relations skills as well as job skills will be enhanced by student participation in VICA. VICA activities should complement instruction in the industrial education classroom and lab. They should be integrated as a curriculum delivery system and not allowed to become an extracurricular activity.

Cooperative Work Experience

Some of the competencies identified in this guide cannot be fully developed at a school site. A work station in the community offers realistic experiences in fulfilling the program goals in career development and human relations. Cooperative Work Experience offers an excellent vehicle for the delivery of instruction. With well developed training plans, teachers and employers can cooperate to prepare students for employment. Cooperative Work Experience extends the instructional program beyond the availability of equipment and instructor time at the local school. Teachers and employers must maintain regular communications to assure that students are receiving a high quality experience.

The Rural Student Vocational Program (RSVP) provides a two week fulltime work experience for students from rural areas where job stations are limited or non-existent.

The Job Training Partnership Act (JTPA) provides on-the-job experience to disadvantaged youth in both urban and rural areas.

Role of Instructor in Curriculum Planning, Implementation and Evaluation

The vocational instructor fulfills many roles which include the following responsibilities:

- Prepares a written vocational program plan.
- Develops and maintains a written program philosophy with objectives that support the philosophy.
- Maintains a written list of competencies identified as needed for the program area.
- Devises and maintains a classroom management system for implementing the curriculum materials provided for the program area.
- Evaluates the curriculum content periodically to determine curriculum changes and update. This includes the involvement of the students (present and former), advisory committee members, and other personnel.
- Blocks units of instruction and plans lesson plans based on the competencies of the occupation.
- Provides appropriate instructional materials, supplies, and equipment for the students to use.
- Reviews the instructional materials to assure that they are free from sex bias and sex role stereotyping.
- Works with an advisory committee.
- Assists and/or serves as an advisor to the appropriate student organization related to the vocational program area.
- Plans and arranges an appropriate classroom learning environment. This involves assisting students of different abilities to work at their own pace and in cases where remedial instruction is needed, securing additional help for those students.
- Reinforces basic skills of reading, communication (written & oral) and computation through vocational education experiences.
- Helps determine what objective(s) should be established for handicapped students as a part of the individual educational plan (IEP) development.
- Uses a grading procedure that is made available to all students at the beginning of their training.
- Sets an example for grooming and dress that is generally found in the occupational area in business or industry to enable students to establish appropriate standards.

Benefits of the Competency-Based Curriculum

Competency-based vocational education offers several benefits to students:

1. The competencies/tasks are directed to the student and provide measurable criteria for determining when the student has acquired the necessary knowledge and skills.

2. Students receive realistic training for the job. They become competent in tasks that are relevant to the occupation.

3. Students know what is expected of them throughout the course. The competencies are made available to them at the onset. They know what they will be doing and how well it must be done.

4. Each student is individually responsible for completing each competency attempted in the curriculum.

5. Students are not compared with other students in their accomplishments because each is expected to work according to his/her individual capabilities and learning style. Because of the various evaluation policies of different school systems, the ideal of not comparing students in determining grades is not always possible. However, the basic thrust of the competency-based program is to evaluate each student according to his/her accomplishment of each task as he/she works up to individual capability.

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Program Development

Program Development

The format of this handbook was selected to aid administrators and teachers in concentrating on the skills needed for vocational training. It will assist in selecting the array of units and the delivery system which fit the school. This provides the flexibility of varying the course content to include the most valuable skills as appropriate for the scope and sequence. The primary importance is that students are able to secure the foundation skills. Schools can vary their delivery systems to maximize student opportunities by:

1. Offering courses on alternate years or other planned sequences
2. Offering two or more courses in the same class
3. Providing individualized materials and instruction

A matrix is included in this guide for use in planning the courses to be offered and the content of each course.

III
Competencies and Tasks

Employability Skills

Competency: Identify career choices

Tasks: Conduct a self-assessment:

a. Assess values in relation to work
b. Recognize skills and aptitudes
c. Assess employment history and experience
d. Describe obstacles to employment
e. Use Alaska Career Information System and other career counseling systems and publications

Identify career clusters:

a. Know specific jobs within clusters and duties
b. Describe apprenticeship/training programs

Explain the use of labor market information:

a. Describe the current local labor market
b. Identify growth/demand occupations
c. Relate career choices to local labor market

Select a career goal:

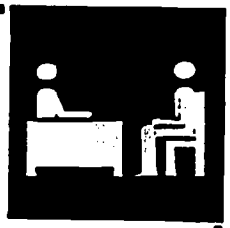
a. Know how skills could be used in other jobs
b. Plan for career goal
c. Develop specific steps to reach goal

Competency: Identify jobs using industrial education skill training

Tasks: Describe jobs in:

a. Auto Maintenance
b. Building Maintenance
c. Commercial Fishing
d. Communications
e. Construction
f. Drafting
g. Electronics
h. Energy and Power
i. Forestry and Logging
j. Graphics
k. High Technology
l. Horticulture and Gardening
m. Manufacturing
n. Metals
o. Mining and Petroleum
p. Small Engine Maintenance

q. Technological Impacts
r. Transportation
s. Wiring and Plumbing
t. Woodworking



Competency: Identify employment opportunities

Tasks: Identify requirements for job

Investigate educational and occupational opportunities

Locate resources for finding employment

Confer with prospective employers

Competency: Prepare a resume and job application

Tasks: Obtain a social security number

List:

a. past and present work experience
b. hobbies and interests
c. community activities or memberships
d. in-school activities or memberships
e. awards, positions or club offices
f. adult references, including addresses and phone numbers

Competency: Write a cover letter

Tasks: Explain when and how to write a cover letter

Explain what a writing sample tells a potential employer

List the things the cover letter must say

Competency: Prepare for an interview

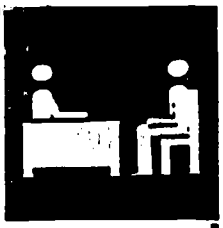
Tasks: Explain how to contact an employer to schedule an interview

Describe questions and responses asked in an interview

Explain proper etiquette for an interview

Describe how to dress for an interview

Discuss how to end an interview



Competency: Follow up the interview

Tasks: Analyze the interview

Determine whether a follow-up letter or call is required

Explain how to write a thank-you note or make a follow-up call

Competency: Dress appropriately on the job

Tasks: Describe proper dress for jobs in:

a. Auto Maintenance
b. Building Maintenance
c. Commercial Fishing
d. Communications
e. Construction
f. Drafting
g. Electronics
h. Energy and Power
i. Forestry and Logging
j. Graphics
k. High Technology
l. Horticulture and Gardening
m. Manufacturing
n. Metals
o. Mining and Petroleum
p. Small Engine Maintenance
q. Technological Impacts
r. Transportation
s. Wiring and Plumbing
t. Woodworking

Discuss the importance of being neat and clean

Competency: Prevent work-related injuries

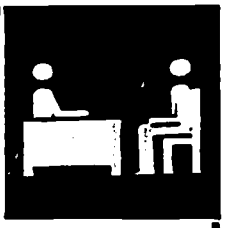
Tasks: Describe the importance of safe working attitudes

Describe first-aid and CPR

Discuss the importance of wearing protective gear including: hardhats, eye and ear protection, respirators, gloves, chaps, safety lines, boots, personal flotation devices and survival suits

Describe safety procedures for:

a. chemicals and explosives
b. flammables
c. electricity
d. soddering and weeding
e heavy equipment
f hand and power tools
g. ladders and scaffolds
h. construction materials



i. lifting
j. extreme weather conditions
k. boats and aircraft
l. noise
m. wildlife and domestic animals
n. hazardous wastes and carcinogens
o. driving
p. working in enclosed areas

Discuss special safety considerations relevant to each industrial education area

Competency: Be reliable and dependable

Tasks: Maintain acceptable attendance records

Explain importance of being on time

Give timely notice of interruptions to work schedule

Demonstrate reliability

Follow rules of work site or training site

Competency: Maintain good personal relations

Tasks: Use positive attitudes with others

Accept supervision and criticism

Cooperate with others

Accept the chain of command

Competency: Be honest

Tasks: Define honesty and integrity

Explain how to deal with theft and dishonesty

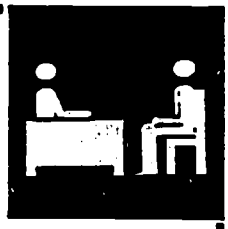
Relate employee integrity to overall company performance

Competency: Demonstrate initiative and productivity

Tasks: Explain importance of:

a. Organizing time effectively
b. Being responsible
c. Caring about the quality of work

Discuss the value of constructive suggestions



Competency: Be assertive

Tasks: Differentiate between assertive, aggressive and passive behavior

Discuss whom to go to for employee problems

Competency: Demonstrate work maturity

Tasks: Describe importance of openness to new situations on the job

Discuss the characteristics of the mature person:

a. Self-acceptance
b. Consideration and respect for others
c. Self-control
d. Positive thinking and attitudes
e. Flexibility

Describe the importance of being flexibile

Name ways to develop and maintain good work relationships

Explain the difference between personal and job-related problems

Describe the importance of orderly and systematic work behavior

Competency: Identify personal responsibilities related to employment

Tasks: Secure adequate transportation

List adequate child care alternatives

Inventory independent living skills

Develop personal finance plan

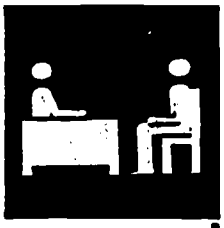
Discuss employer's expectations regarding substance abuse

Competency: Maintain good health for effective job performance

Tasks: Explain the relationship between regular exercise, adequate rest, nutrition and job performance

Discuss the issue of smoking on the job

Discuss drug abuse as it relates to job performance



Competency: Identify employee rights and responsibilities

Tasks: Discuss state labor laws relating to compensation

Explain the use of tax forms

Explain the minimum wage and types of exempt businesses

Explain employee benefits, rights and responsibilities

Explain labor contracts, grievance procedures and the role of unions

Explain labor contracts, grievance procedures and the role of unions

Discuss a sample company personnel policy

Competency: Follow OSHA guidelines

Tasks: Explain the purpose of the Occupational Safety and Health Act

Describe your rights under workers-right-to-know and other portions of the Act

Discuss how to resolve hazardous and OSHA violation situations

Competency: Follow verbal and written directions

Tasks: Follow directions

Ask for clarification

Use listening skills

Review situations of poor communications

Explain the importance of reading directions when assembling and repairing equipment

Competency: Apply reading and writing skills

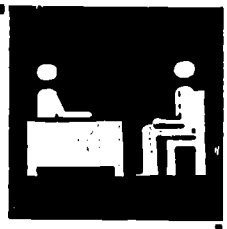
Tasks: Describe how to find information in trade and consumer magazines and journals

Describe how to write memos, lists, and reports

Demonstrate how to complete forms accurately

Locate and correct errors in spelling, grammar and punctuation

Describe how to use supply catalogs to identify and order materials



Competency: Use effective leadership skills

Tasks: Describe the Vocational Industrial Clubs of America (VICA) and how it teaches leadership skills:

a. Participate in meetings according to rules of parliamentary procedure
b. Function effectively on committees by accepting assigned responsibilities
c. Plan and conduct effective group leadership activities
d. Participate in society in a democratic way
e. Be punctual and dependable
f. Follow rules, standards and policies
g. Work cooperatively with others

Identify leadership characteristics and responsibilities

Demonstrate membership characteristics and responsibilities

Evaluate career options and employment opportunities

Competency: Solve problems

Tasks: Explain the importance of having a method for analyzing and solving problems

Identify problems

Obtain information

Analyze problems

Develop and analyze alternative solutions

Choose a course of action

Persevere through hardships

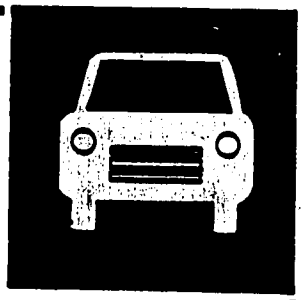
Recognize and change unworkable solutions

Competency: Identify proper termination procedures

Tasks: Describe how to:

a. Write a letter of termination
b. Conduct an exit interview
c. Write a letter of recommendation
d. Request for advance notice
e. Make final settlements (in regards to retirement, physical injury, social security, severance pay, etc.)

Auto Maintenance



(A) Indicates Advanced Task or Competency

Competency: Understand automotive history

Tasks: Describe the historical development of the automobile

Describe the development of gasoline and diesel engines

Competency: Identify internal combustion engine terms, principles, and technology

Tasks: Explain terms and principles associated with various internal combustion engines

Compare the workings of gasoline and diesel powered automobiles

Explain the operation of turbine and Wankel engines

Describe various types of engines, such as in-line and v-type engines

Competency: Work safely

Tasks: Describe the components of safe automotive working environments

Identify appropriate clothing

Explain personal safety devices such as gloves, safety glasses, and steel-toed boots

Explain proper use of automotive hand and power tools

Describe hazards of using the wrong tools and parts

Describe handling and storage procedures for gasoline and other flammable and hazardous materials

Explain shop equipment procedures for equipment such as hydraulic jacks, impact air tools, grinders, and steam cleaners

Explain procedures for running engines in closed spaces

Explain safe blocking and jacking procedures

Competency: Understand the value of systematic diagnosis

Tasks: Explain the value of methodical diagnosis

Explain systematic approaches to automotive diagnostics

Discuss the troubleshooting significance of relationships between various automotive systems, such as braking, steering, and suspension systems; and fuel, electrical, and transmission systems

Explain diagnostic equipment terms, principles, and use

Competency: Maintain automotive cooling systems

Tasks: Explain cooling systems terms, principles, and components and their functions

Contrast air and water-cooled engines

Explain the function of thermostats, fan belts, pressure caps, and radiators

Explain cooling system diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive fuel systems

Tasks: Explain fuel systems terms, principles, and components and their functions

Explain carburetors and floats, fuel pumps, chokes, and injectors

Explain fuel systems diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive electrical systems

Tasks: Explain electrical systems terms, principles, and components and their functions

Differentiate between ignition, cranking, charging, instrumentation, and lighting systems

Discuss the function, operation, and safe charging of batteries

Explain electrical systems diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive lubrication systems

Tasks: Explain engine lubrication systems terms, principles, and components and their function

Explain lubrication system diagnosis/repair terms, principles, and methods

Competency: Maintain automotive pollution control systems

Tasks: Explain pollution control systems, terms, principles, and components and their functions

Compare various muffler, exhaust pipe, pollution control valve (PCV), and catalytic converter systems

Explain pollution control diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive braking systems

Tasks: Explain braking system terms, principles, and components and their functions

Compare the construction, operation, and servicing of drum and disk brakes

Explain braking systems diagnosis/repair terms and techniques

Competency: Maintain automotive steering systems

Tasks: Explain steering systems, terms, principles, and components and their functions

Compare manual and power steering systems

Explain alignments and wheel balance

Explain steering systems diagnosis/repair terms, principles, and techniques

Inspect and change tires

Competency: Maintain automotive suspension systems

Tasks: Explain suspension systems terms, principles, and components and their functions

Compare various shock absorber and spring systems

Explain suspension systems diagnosis/repair terms and techniques

Competency: Maintain automotive chassis systems

Tasks: Explain chassis systems terms, principles, and components and their functions

Explain how to locate and service chassis lubrication points

Explain chassis systems diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive transmission systems

Tasks: Explain transmission terms, principles, and components and their function

Compare manual and automatic transmissions

Explain transmission systems diagnosis/repair terms, principles, and techniques

(A) Replace a universal joint

(A) Overhaul manual and automatic transmissions

Competency: Maintain automotive heating and air conditioning systems

Tasks: Explain heating and air conditioning systems terms, principles, and components and their functions

Explain the significance of the source of energy for these systems

Explain heating and air conditioning systems diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive hydraulic systems

Tasks: Explain hydraulic systems terms, principles, and components and their functions

Explain hydraulic systems diagnosis/repair terms, principles, and techniques

Competency: Perform routine automotive maintenance and tune-ups

Tasks: Demonstrate how to check and adjust fluid levels: radiator, master cylinder, battery, engine oil, transmission, and rear end

Check and adjust tire pressure

Change:

a. engine oil and filter
b. air filter
c. spark plugs and points
d. dwell and timing
e. light bulbs and wiper blades
f. fuel filter

Adjust fan belt tension

Clean battery terminals

Lubricate moving parts such as: door hinges, hood hinges, windows, chassis

Review the owner's manual of the latest model of an automobile to determine unique maintenance requirements

(A) Conduct automotive inspection

(A) Use automotive diagnostic equipment

Competency: Winterize automotive systems

Tasks: Explain how extreme temperatures impact automotive systems

Determine local temperature and humidity parameters and other climatic considerations

Describe winterization procedures for each of the above automotive systems

Discuss the significance and proper installation and/or use of:

a. snow tires and chains
b. engine block heaters
c. anti-freeze and radiator heaters
d. winter-weight oil and lubricants
e. thermostats
f. battery insulation/heaters
g. special windshield wash solutions
h. graphite door lock lubricant
i. aerosol starting compounds
j. fuel additives (Heet)

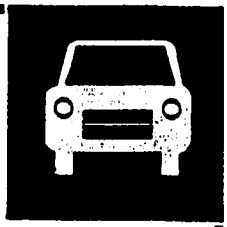
Follow manufacturers' recommendations

Discuss special considerations for working on/with cold vehicles and metals

Discuss winter carbon monoxide (CO) hazards and poisoning prevention techniques

Avoid operating vehicles in extreme conditions

Assemble survival gear for winter vehicle operation



Competency: (A) Map automotive systems

Tasks: Explain how to map the following automotive systems:

a. electrical
b. cooling
c. fuel
d. lubrication
e. pollution control
f. braking
g. steering
h. suspension
i. chassis
j. transmission
k. hydraulic
l. heating and air conditioning

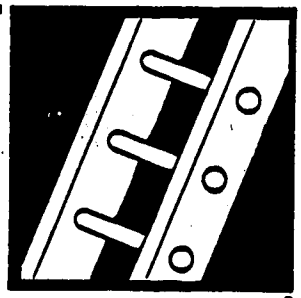
Competency: (A) Apply automotive maintenance skills

Tasks: Discuss the steps in examining and selecting a used automobile

Compare ways for reducing the cost of automotive repairs such as use of used parts

Troubleshoot non-automotive vehicles such as marine engines, motorcycles and ATV's

Building Maintenance



(A) Indicates Advanced Task or Competency

Competency: Maintain building floors

Tasks: Select and use proper floor maintenance chemicals

Handle and store chemicals safely

Remove dirt and grease from resilient or hardwood floors

Seal, wax and buff a resilient and hardwood floor

Strip or light scrub a floor using an automatic floor machine

Sweep and mop stairs

Competency: Use and maintain cleaning equipment

Tasks: Explain how to:

a. Operate and maintain wet and dry vacuums
b. Treat a dust mop
c. Use a mop and bucket
d. Operate a floor machine

Competency: Clean walls and windows

Tasks: Explain how to safely use ammonia, TSP, or disinfectant describing appropriate usage for such chemicals

Wash and spot-clean walls and windows

Break in a new chalkboard

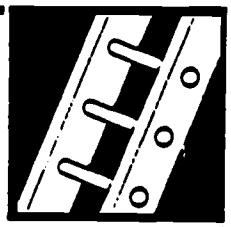
Competency: Clean carpet

Tasks: Select cleaning fluids and safely handle and use for given task

Shampoo a carpet using the dry-foam method and a rotary machine

Vacuum

Spot-clean stains and gum from carpets



Competency: Maintain light fixtures

Tasks: Select cleaning fluid and safely handle and use for given task

Replace balast and starters in flourescent fixtures

Wash fluorescent fixtures

Replace burned-out or faulty fluorescent lamps and incadescent bulbs

Competency: Fix basic electrical problems

Tasks: Identify safety procedures for working with electricity and electrical devices

Identify and use common electrical tools including:

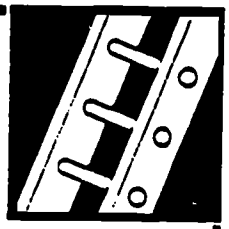
a. Pliers
b. Electrical pliers
c. Screwdrivers
d. Neon testers
e. "Fish" tape
f. Voltmeters
g. Ammeters (in line and clamp on)
h. Volt-Ohm-Meters
i. Electric hand drills
j. Bit and brace
k. Strippers
l. Needle-nosed pliers
m. Side cutters
n. Stud locators

Explain basic electrical theory and ohms law

Explain basic designs of building electrical circuits

Identify, troubleshoot, and repair common electrical fixtures including:

a. Service panels
b. Meter boxes
c. Breakers
d. Fuse boxes
e. GFI controls
f. Switches
g. Main panels
h. Sub-panels
i. Conduits
j. Junction boxes
k. 220 outlets
l. 110 outlets



(A) Troubleshoot and repair electrical control and communication systems including:

a. temperature control systems
b. electric alarm and monitoring systems
c. communications systems

Competency: Repair and paint damaged walls

Tasks: Replace broken window glass

Repair nail holes

Read blueprints

Locate wall studs

Patch damaged walls

Replace, tape and paint drywall

Identify types and kinds of paints

Use brushes and rollers

Paint interior and exterior walls

Competency: Clean and polish surfaces

Tasks: Explain the different types of polishes and their applications

Select and use appropriate cleaning fluid

Clean and polish metals such as aluminum/stainless steel/copper

Clean and dust window sills and desks

Competency: Maintain basic plumbing

Tasks: Explain plumbing terms and principles

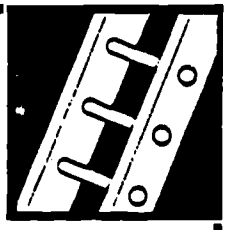
Use a tube cutter on copper tubing

Repair dripping faucets

Clear clogged drains and traps

Cut plastic pipe with saw

Use a flaring tool to make a flare on the end of a copper tube



Solvent-weld plastic pipe joints

Make a sweated joint on a copper tube

Use a pipe vice

Sweat-fit a copper "T" into an existing line

Thread pipe by hand

Operate a propane torch

(A) Cut, taper, and thread a length of pipe using a power threading machine

(A) Use a power tool to cut pipe

(A) Cut the proper threads on ends of galvanized pipe using a power threading machine and tapering pin

Competency: Service heating and other building support equipment

Tasks: Distinguish between types of heating systems

Troubleshoot heating system problems

Order heating system parts and supplies

Check and service an air compressor

Determine water level in a boiler

Change the heating plant air filter

Check oil level in oil tank

Check propane level in propane tank

Check propane fixtures for leaks

(A) Evaluate the heating system in terms of building insulation, air supply, and energy conservation

Competency: Secure building and property

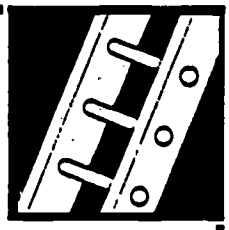
Tasks: Install/repair a chain link fence

Install various door lock devices

Secure all locks

Brace windows and doors when appropriate

Test and repair security system



- (A) Differentiate among several types of electronic security systems

Competency: Safely store materials and chemicals

Tasks: Label shelves for storage of material

Store flammables in proper place

Properly label all chemicals

Store hazardous substances out of the reach of children

Wear appropriate clothing and protective devices while working with hazardous substances

Competency: Perform outdoor building maintenance

Tasks: Select chemicals for ice removal

Remove snow and ice

Use plows and blowers safely

Repair exterior siding, gutters, shutters, etc.

Repair sidewalk, steps and stairs

(A) Load and unload material with a forklift

Competency: Care for lawn and shrubbery

Tasks: Plant and maintain shrubbery

Prepare soil and plant and maintain lawn

Mow a lawn using a power-operated hand mower

Select and spread fertilizer on a lawn

Operate and maintain mechanical spreaders and mowers

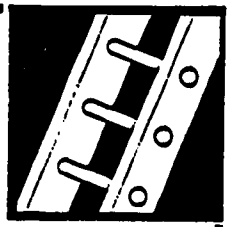
Discuss the safe use of herbicides

Run a lawn edger

Plant and maintain flower beds

(A) Identify all control devices, their locations, and the safety rules related to the operation of a tractor

(A) Operate a tractor with mower attachment



Competency: Dispose of trash

Tasks: Collect trash

Transport trash properly

Burn trash properly (if applicable), removing aerosol cans, batteries, and other items which might explode

Dispose toxic materials properly

Competency: Maintain rest rooms

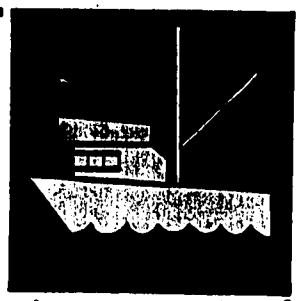
Tasks: Select and use proper cleaning fluid

Wet mop with disinfectant

Fill dispensers

Clean and sanitize sinks, mirrors, toilets, urinals, walls and partitions

Commercial Fishing



(A) Indicates Advanced Task or Competency

Competency: Identify the harvesting and processing of marine products

Tasks: Identify lifecycles and habitats of commercial marine species

Explain harvesting methods for common non-vertebrate and vertebrate marine species

Explain processing methods for marine products

Explain importance of following state and federal fishing regulations

Discuss the economics of and procedures for setting up fish hatcheries

Discuss the economic and biological impacts of manipulating gene pools and artificial rearing

Identify edible seaweeds

Explain how seaweeds are harvested, preserved and processed

Competency: Correctly handle, process and market marine products

Tasks: Explain proper ways to handle fish and shell fish

Explain the importance of vessel and product sanitation

Explain proper methods of storing fish products including icing and refrigeration

Explain methods of cleaning seafood

Describe both shore-based and floating processing operations

Describe and practice quality control in processing

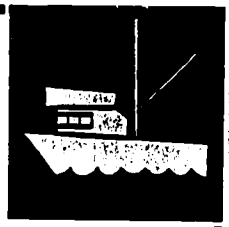
Keep seafood cool, clean, moist and moving

Explain canning and freezing processes

(A) Trace marine products from the ocean to the retailer

(A) Explain economics of commercial fishing

(A) Explain marketing considerations



Competency: Use good boating safety and seamanship

Tasks: Explain the basic terms and principles of seamanship

Explain basic knot techniques

Describe boating laws

Explain navigational aids and charts

Explain how to use nautical equipment such as compasses, sextants, dividers, radar, fathometers, sonar, loran, barometers, and CB and marine radios

Recognize changes in weather conditions

Competency: (A) Get a vessel underway

Tasks: Develop and follow a check list for getting underway

Engage bilge and engine room blowers and bilge pumps

Maintain proper level of coolant in expansion tank

Determine if all navigation lights are functioning

Tighten engine mounts

Inspect fire-fighting equipment for wear, location, and type

Secure deck equipment, lashings, hausers, or mooring lines

Inspect personal flotation devices for number, fit, integrity, and location

Inspect survival suits for number, fit, integrity, location and type

Inspect vessel for fuel leakage

Prepare list of equipment to be checked for oil leakage

Secure watertight doors, hatches, vents, and skylights

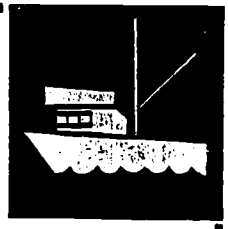
Bleed air compressor of water

Check and maintain batteries

Determine fuel levels

Inspect water level indicators for cleanliness

Test radio equipment



Inspect antennas

Determine if hydraulic steering equipment is free of air and water

Determine that rudder stuffing box is functioning properly

Tighten propeller stuffing box

Determine if proper voltage is being generated

File a float plan

Competency: (A) Maneuver a vessel

Tasks: Obtain a current weather forecast

Observe the rules of the road

Follow safe boating practices

Use navigational aids, tide and current charts and equipment

Maintain adequate safety margins in regards to weather and sea conditions

Competency: (A) Conduct deckhand duties

Tasks: Hand or hoist equipment and supplies aboard

Work riggings such as nets, slings, hooks, cables, booms, and hoists

Stand lookout, steering, and engine room watches

Operate dories, dinghies, and skiffs

Attach accessories, such as floats, weights, and markers to nets and lines

Pull and guide nets and lines onto vessel

Wash deck, conveyors, knives, and other equipment, using brush, detergent, and water

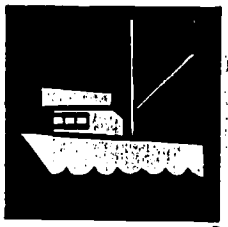
Lubricate, adjust, and maintain engines and equipment

Competency: (A) Anchor a vessel

Tasks: Maneuver vessel to anchorage

Anchor vessel by using anchor winch or windlass

Retrieve and secure anchor and stack (tier) anchor chain in locker



Competency: (A) Dock a vessel

Tasks: Assign tasks and stations for vessel mooring

Maneuver to dock

Secure mooring lines to dock and/or other vessels

Secure engine room and secure propeller shaft

Release towing gear

Competency: (A) Conduct line fishing duties

Tasks: Define line fishing terms

Explain principles and techniques associated with various line fisheries

Lay out gear

Cast line into water and hold, anchor, or troll

Retrieve gear onto boat deck by hand, reel, or winch

Remove, clean, pack and store catch appropriately

Slit fish, remove viscera, wash cavity and prepare for storage

Competency: (A) Perform pot and trawl fisher duties

Tasks: Define pot fishing terms

Explain pot fishing techniques

Rig boat and deploy gear such as pots, floats and markers

Tie marker float to line, attach line to pot, fasten bait inside pot, and lower pot into water

Retrieve gear and remove catch

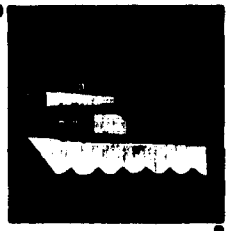
Hook marker float with pole and haul up pot

Remove catch or dump catch on deck

Measure catch with fixed gauge

Place legal catch in container and return illegal catch to sea

If applicable, rig and lower dredge (rake scoop with bag net attached), drag dredge behind boat to gather marine life from water bottom, and hoist it to deck by hand using block and tackle



Competency: (A) Conduct net fishing duties

Tasks: Define terms associated with various net fisheries

Explain principles and techniques associated with various net fisheries

Locate quarry using equ ment available

Operate and maintain net fishing equipment such as dip, diver, gill, hoop, lampara, pound, trap, reef, trammel, and travel nets

Operate and maintain seine equipment such as purse seine, haul, drag, or beach seine and power skiffs

Insert and attach hoops, rods, poles, ropes, floats, weights, beam runners, other boards, and cables to form, reinforce, position, set, tow, and anchor net as required

Attach appropriate flags and lights to buoys to mark and identify nets

Haul net with appropriate gear

Remove catch using appropriate techniques and equipment such as dip net, brail buckets, hydraulic pumps, conveyor, lifting net, blocks, tackles, and dumping catches

Clean, store and transfer catch appropriately

Competency: (A) Maintain vessels

Tasks: Arrange for grid, dry docking, or haul-out

Change brushes in auxiliary engines

Change lube oil and fuel filters on auxiliary engines

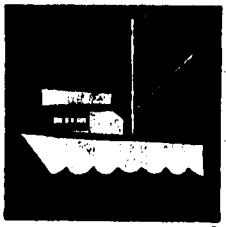
Determine if motor bearings are excessively worn

Clean electric motor

Prepare list of hoses, valves, connections, gaskets, and tanks needing repairs

Determine if const-a-voltage regulator is functioning properly

Determine if drive bolts on air compressors are excessively loose



Tighten panel box fittings to prevent vibration

Clean keel cool strainers, oil coolers and oil strainers in marine gears

Drain water out of fuel traps

Tighten fuel and oil line connections on engines

Inspect day tanks containing fuel for leaks

Lubricate deck and engine room equipment on a regular schedule

Determine vessel's manning requirements

Splice eye into line

Wash down vessel's superstructure and decks

Inspect and maintain hull, keel, and rudder assembly

Competency: (A) Prepare meals aboard the vessel

Tasks: Plan menus

Obtain and store food properly

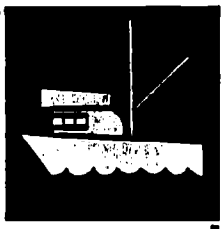
Prepare a balanced meal

Clean galley deck, woodwork, cabinets, dishes, glasses, flatware, trays, pots and pans

Competency: (A) Perform vessel emergency procedures

Tasks: Explain emergency procedures for: fire, collisions, capsize, foundering, man-overboard and personal injuries:

a. Alert crew
b. Issue personal flotation and immersion protection devices
c. Administer first aid to prevent shock and control bleeding
d. Administer CPR
e. Launch and operate lifeboat and life raft
f. Close emergency fuel shutoff valves
g. Extinguish Class "C" fire
h. Act as lookout to keep person in sight who has been lost overboard
i. Secure engine room to prevent spread of fire
j. Send out distress signals
k. Sound abandon-ship alarm, if necessary



Competency: (A) Maintain and operate fish processing and preservation equipment

Tasks: Explain the maintenance and operating procedures for:

a. freezing equipment
b. canning equipment
c. ice-making equipment
d. auxiliary power generating equipment
e. seafood cleaning equipment
f. conveyor and product handling equipment
g. chilling and cooling equipment
h. testing and quality control equipment

Competency: (A) Maintain fish quality

Tasks: Define fish processing and refrigeration terms

Identify fish processing sanitation principles and procedures

Determine how long various marine products can be preserved by refrigeration

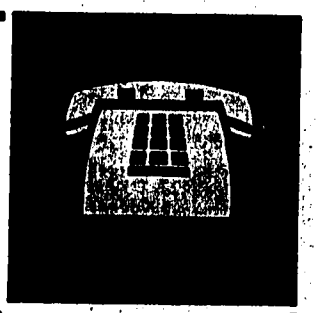
Explain upper and lower refrigeration temperature limits for the various marine products

a. Recognize potential sanitation problems
b. Explain disinfecting procedures
c. Plan stock rotation to insure freshness

Identify potential chemical, biological and bacteriological problems in the fishing industry

a. Conduct bacteria tests
b. Explain how to identify problems by sight and smell
c. Properly dispose of contaminated marine products
d. Explain how to anticipate and prevent sanitation problems before they occur

Communications



(A) Indicates Advanced Task or Competency

Competency: Identify the principles of light and sound transmission

Tasks: Describe the nature of light and sound

Describe implications of satellite communications

Describe how a communications satellite functions

Explain the concept of orbit-stationary orbit

Explain how a ham radio works

Explain ways of transmitting microwaves

Describe how radar, lasers and fiber optics works

(A) Explain two ways signals are sent by light

(A) Control a device using light rays

(A) Transmit light through a fiber

(A) Explain how fiber optics is used in telephone communications

(A) Contrast the advantages and disadvantages of fiber optics in communication

(A) Construct a project using fiber optics

(A) List industries utilizing fiber optics

Competency: Understand how the telephone works

Tasks: Define the terms associated with telephones and telecommunications

Explain the principles of telephones and their operations

Describe the nature of sound

Identify the inventor of the telephone

Describe the principles of microphone operation

Explain how the voice causes changes in electrical impulses in the phone

Explain how the receiver converts the transmitted current to audio-frequency

Explain the function of the diaphram in the sender and the receiver

Sketch a typical telephone circuit

Explain ways telephone electrical impulses are transmitted

Explain phone industry jobs

(A) Contrast information transmission by acoustical energy with that of other energy sources

Competency: Understand how the radio works

Tasks: Define the terms associated with radios and their operations

Explain the principles associated with radios and their operations

Explain the meaning of AM and FM radio dial numbers

Explain how sound is transmitted and received

Describe radio industry jobs

(A) Sketch a simple sender-receiver radio circuit

(A) Construct a simple crystal set receiver

Competency: Understand how a television functions

Tasks: Define terms associated with televisions and their operations

Explain the principles associated with televisions and their operations

Contrast television and radio

Explain the function of the television camera

Identify TV's impact on society

Explain what is meant by line of sight transmission

Explain TV-related jobs

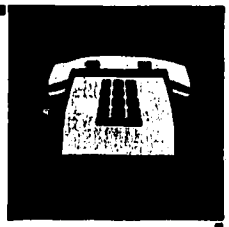
Competency: Identify recent innovations in home communications

Tasks: Identify ways cable systems may communicate between homes

Explain how a video tape recorder can be used in home communications

Contrast a video disc player with a phonograph

Describe the communications potentials of home computers



(A) Name types of computer-generated audio

(A) Describe advances in acoustical information storage and retrieval

Competency: Identify uses of citizens band and amateur radios

Tasks: Define terms associated with citizens band and amateur radios

Contrast radio transmitters and receivers

Explain uses of CB Channels

Name basic requirements for ham operators

Identify regulations governing the use of CB and ham radios

Discuss the issue of privacy and censorship in communications

(A) Send voice and code messages by walkie-talkies

Competency: Identify computer communications methods and systems

Tasks: Differentiate among several types of computers

Explain computer terms and principles

Contrast methods of electronic storage

Explain magnetic tape use in printed communications

Explain facsimile machines and optical scanners

Discuss the impact of computers on communication

Explain ways computers "talk" to each otheir

Explain how a dot matrix printer produces a letter

List jobs in computer communications

Describe historical developments in electron generation

Contrast electronic input and output devices

Describe simple communication systems linking people to people, people to machines, machines to machines, and machines to people

(A) Discuss electrical theory, control, and transmission as they relate to electrical applications in telecommunications

(A) Discuss basic elements of electronic telecommunications such as: semi-conductors, integrated circuits, and computer circuits

(A) Describe basic principles of acoustical communication, electronic telecommunication, and computer information storage and retrieval systems

(A) Identify major developments in telecommunication technologies

(A) Describe the operation of major components used in various telecommunications systems

Competency: Analyze the effects of telecommunications on society

Tasks: Discuss the information revolution's impact on individuals and institutions

Discuss implications of the automated home

Predict future telecommunications systems

Describe jobs in the telecommunications field

Construction

(A) Indicates Advanced Task or Competency

Competency: Work safely

Tasks: Follow directions and procedures

Dress appropriately

Explain emergency shop procedures

Explain first-aid procedures

Demonstrate proper use of tools

Follow job-site rules and government regulations

Competency: Use common construction tools and materials

Tasks: Explain the terms and principles associated with construction

Explain the various types of building materials used in construction:

a. Identify plywood grades and explain their uses in residential construction
b. Identify lumber grades and sizes, their relative costs and common uses
c. Identify a variety of fasteners used in construction
d. Identify common flooring, walls, roofing, and insulation materials

List commercial and non-commercial construction materials locally available

Identify hand and power tools and their use and care

Discuss the advantages and disadvantages of reusing construction materials

(A) Frame up walls, floors, ceilings, roofs, stairs, doors, and windows

(A) Select foundation appropriate to building sites

(A) Identify energy-efficient insulation, heating and moisture management systems

Competency: Perform construction calculations

Tasks: Compute linear distance and angles

Calculate measurements for construction plans and projects

Use measurement and layout tools such as compass, protractor and squares, calculators, tapes and rulers

Compute the area of regular geometric figures commonly encountered in construction projects

Make drawings to scale

Calculate quantities and cost of building materials

Prepare thorough materials lists including unit prices, sub-totals and totals

Competency: Identify site selection considerations

Tasks: Name factors that affect site selection such as:

a. cost
b. weather exposure
c. zoning
d. flood or other natural dangers
e. neighborhood
f. geology (sub-surface characteristics)
g. topography
h. site preparation
i. solar potential

(A) Layout a structure on a building site

Competency: Read blueprints

Tasks: Define blueprint terms

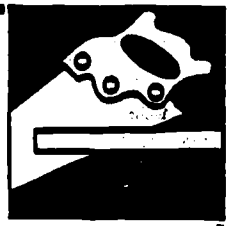
Explain blueprints and their purposes

Orient the blueprints

Identify lines and symbols used on blueprints

Explain blueprints specifications and instructions

Translate blueprint scale measurements to actual measurements



Competency: Select and install insulation and vapor barriers

Tasks: Explain insulation and vapor barrier terms and principles

Identify and evaluate insulation materials on the basis of R-factor, longevity, and cost effectiveness

Discuss methods for installing insulation

Discuss the significance of R-factor for selecting insulation materials

Calculate the dollar value of energy savings attained through retrofitting existing structures to higher R-values

(A) Calculate pay back periods for various insulation systems

(A) Calculate BTU heating requirements for residential structures

(A) Contrast the R-values of building materials commonly used in log and frame construction

(A) Compare cost efficiency of different heating systems in existing structures given R-value and cubic footage

Competency: Identify alternative and energy-efficient home heating systems

Tasks: Define terms associated with energy-efficient home heating systems

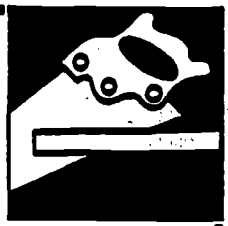
Explain principles associated with energy-efficient home heating systems

Compare efficient energy technologies such as:

a. Multi-fuel heating systems
b. Dual heating systems
c. Sectional controls
d. Thermal storage
e. Heat pumps
f. Air to air heat exchanger

Compare substitute methods of heat or power generation such as:

a. Geothermal
b. Solar
c. Biomass
d. Wind energy
e. Hydro



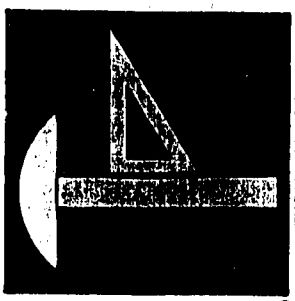
Competency: Identify construction trade career opportunities

Tasks: Discuss local and statewide career opportunities

Describe training requirements for various construction trades

Describe lifestyle considerations entailed in a variety of construction trades

Drafting



(A) Indicates Advanced Task or Competency

Competency: Follow drafting safety procedures

Tasks: Describe the first-aid procedures relevant to drafting

Maintain a clean and orderly work area

Competency: Care and store drafting equipment properly

Tasks: Explain equipment use and care

Adjust and calibrate equipment

Competency: Use drafting tools

Tasks: Identify types of drafting tools

Explain the proper use of the following tools:

a. protractors
b. triangles
c. french curves
d. templates
e. erasing shields
f. erasers
g. drafting pencils
h. t-squares
i. drafting boards
j. drafting tables

Competency: Letter and label title blocks correctly

Tasks: Define lettering and labeling terms

Describe lettering and labeling techniques

Explain standards of accuracy in form and spacing

Competency: Measure and scale drawings

Tasks: Use standard and metric rulers

Draw accurately

Produce drawings to the proper scale using a drafting scale

Scale drawings up and down using drafting scale

Competency: Complete standard orthographic drawings

Tasks: Define terms associated with orthographic drawings

Identify orthographic drawing techniques

Reproduce orthographic drawings to specified scales

Produce accurate orthographic drawings from rough sketches and isometric drawings

Produce an orthographic drawing of a rectangular object

Competency: Produce drawings

Tasks: Explain the difference between isometric, oblique, and one and two-point perspective drawings

Explain how to produce an accurate isometric drawing to scale

Explain how to produce an isometric drawing from an orthographic drawing

Explain how to make oblique and one and two point perspective drawings

Competency: Draw architectural plans for a small house

Tasks: Orient a house on a lot

Draw a floor plan

Draw an elevation view

(A) Detail plan

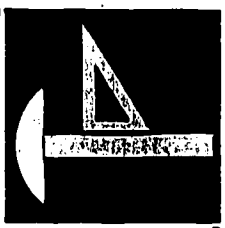
Competency: Identify occupations which require drafting skills

Tasks: Name and describe occupations requiring skill at creating or interpreting technical drawings

Contrast machine drafting with electrical drafting

Discuss the importance of drafting to electronic and computer design

Examine the applications of drafting in the field of architecture



Competency: (A) Complete drafting plans for a metal or woodworking project

Tasks: Sketch a project

Choose materials and hardware

Make working drawings

Identify proper orientation of drawings and plans

Interpret drawings

Competency: (A) Use a CAD (Computer Aided Drafting) system

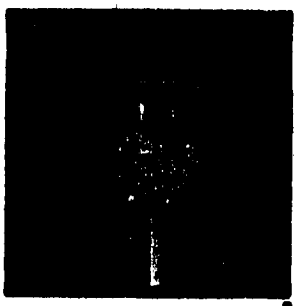
Tasks: Explain CAD terms and principles

Discuss the limitations and advantages of CAD systems

Discuss current and potential CAD applications

Explain how to operate a CAD system

Electronics



(A) Indicates Advanced Task or Competency

Competency: Apply principles of electronics

Tasks: Explain electronic terms and principles

Explain the theory of operation in AC and DC circuits of Ohm's Law, Kirchoff's Law, and Watt's Law involving resistors, coils, capacitors, and transistors

Identify common electronic components and circuits

Interpret general schematic diagrams

Explain methods of electronic design

Competency: Set up a circuit

Tasks: Perform relevent mathematical calculations

Explain relevant safety procedures

Solve electronic circuit problems

Competency: Use electronic test equipment

Tasks: Use a multi-meter (volt-ohm meter)

Describe how to select, purchase, use, and maintain electronic products

Name various electronic controls

Use basic electronic servicing equipment

Examine a given electronic power system

(A) Use an oscilloscope to verify signal patterns in consumer products

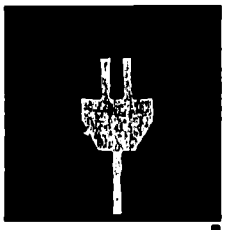
Competency: Service electronic devices

Tasks: Practice electronic soldering techniques

Construct a PC board (layout, etch, drill)

Locate component malfunctions

Mount system in/on physical support



Record meter readings

Splice wires

Solder/unsolder components

Perform quality control checks

Competency: Identify careers in electronics

Tasks: Examine careers in:

a. electrical engineering
b. electrical power engineering
c. electronic engineering
d. electronic equipment design
e. electronic equipment servicing
f. public utilities

Competency: (A) Replace basic electronic components

Tasks: Replace fuse

Replace IC chips and indicator lamps

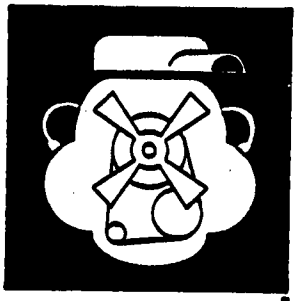
Competency: (A) Clean electronic devices

Tasks: Assemble structural members according to an assembly drawing

Clean:

a. air filters
b. chassis
c. circulation fans (exhaust and intake)
d. contact points
e. drive mechanism
f. reflective mirror
g. speaker grill
h. spindles
i. tape head
j. tape reader
k. tuner
l. volume control

Energy and Power



(A) Indicates Advanced Task or Competency

Competency: Apply principles of energy and power

Tasks: Explain terms and principles associated with energy and power generation, transmission and use

Contrast energy and power

Discuss entropy and inertia

Competency: Identify characteristics of available energy

Tasks: Name the characteristics of "available energy"

Identify major forms of energy

Identify examples of potential energy

List examples of kinetic energy

Competency: Apply principles of friction

Tasks: Define friction

Demonstrate natural effects of friction

Identify energy losses due to friction

Identify advantages and disadvantages of friction as a way to harness energy

(A) Discuss perpetual motion

Competency: Identify energy sources

Tasks: List terms describing various energy sources

Differentiate between renewable and non-renewable energy sources

Name the primary sources of world energy

List "exhaustible" sources of energy

Explain fossil fuel formation

Contrast fossil fuels such as crude oil, shale oil, tar sands, coal and natural gas

Identify the uses of major fossil fuels

Define factors wich determine the viability of energy sources

(A) Discuss problems associated with energy extraction

Competency: Identify energy issues relevant for Alaska

Tasks: List major sources of energy in Alaska

Locate fossil fuel sources in America and Alaska and calculate their energy potential

Identify current methods of power generation in Alaska

Describe potential alternative energy sources for Alaska

Explain the terms and principles of hydroelectric generation

Locate hydroelectric power generation plants in Alaska

Explain considerations affecting Alaskan energy transportation or transmission, storage and consumption

Competency: Identify problems inherent in various energy systems

Tasks: Describe the history of American energy development

Identify basic principles of steam turbines

Trace the development and decline of the steam engine

Explain the development and use of wind power

Explain how environmental factors compound pollution problems

Identify problems associated with fossil fuels

Explain the problem of waste heat

Competency: Use English or American units of measurement

Tasks: Define foot-pound or inch-pound of work

Define British Thermal Units (BTU's)

Competency: Use metric measurements

Tasks: Explain basic metric measurements such as meters, liters, and kilos

Convert conventional measurement units to metric:

a. yard and meter
b. pound and kilometer
c. inch and centimeter
d. mile and kilometer
e. quart and liter

Competency: Measure energy

Tasks: Name important units of energy measurement

Name measuring devices used to compare inputs and outputs and to compare the efficiency of various power and energy systems

Identify important instruments for measuring energy

Read gas, water, and electrical meters

Determine which school or home appliances use the most energy

Calculate domestic and school energy consumption and costs

Competency: Understand energy utilization

Tasks: Explain a transactional system utilizing more than one energy source or power system

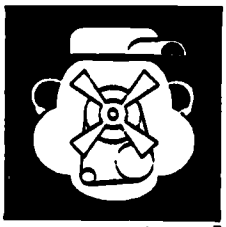
Describe various applications of energy and power in environmental control systems, production control systems, transportation systems, and communication systems

Compare the cost effectiveness of various power and energy systems

Discuss the implications of an existing or proposed power and energy system

Discuss ways to match power systems to jobs

Name ways to conserve energy in the school or home



Competency: Apply principles of mechanical power

Tasks: Explain terms and principles associated with mechanical power and its production

Contrast mechanical power with other energy forms

Competency: Understand mechanical advantages

Tasks: Define terms associated with mechanical advantages

Describe types of mechanical advantages

Name ways of determining mechanical advantages

Name machines using mechanical advantages

Explain how mechanical power changes input power

Explain the relationship between speed and force

Build a mechanical power system

(A) Explain the relationship between theoretical and mechanical advantages

Competency: Apply principles of simple machines

Tasks: Identify types of simple machines

Calculate the ouput force of simple machines

Sketch lever principle machines

(A) Sketch or create inclined plane machines

(A) Calculate the mechanical advantage of a wheel and axle system

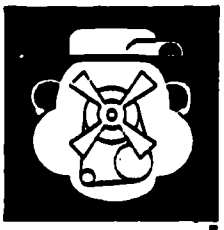
Competency: Apply torque principles

Tasks: Explain torque terms and principles

Explain how torque is measured

Solve several torque problems

Tighten bolts to specs using a torque wrench



Competency: Identify mechanical energy systems

Tasks: Explain mechanical energy terms and principles

Name common mechanical control devices

Compare mechanical energy systems

Competency: Apply principles of gears and pulleys

Tasks: Explain how a pulley works

Calculate the mechanical advantage of single and multiple pulleys

Explain advantages of helical compared to spur gears

Explain how clutches and worm gears work

Contrast the efficiency of gears with those of chains and sprockets

(A) Compare the function of bevel, miter, and spur gears

(A) Calculate gear ratio problems

Competency: Identify belts and chains system

Tasks: List different types of belts

(A) Explain the mechanical advantage of belt drives

(A) Contrast advantages and disadvantages of belt drive systems

(A) Name types of chain drives

Competency: Apply principles of fluid hydraulics

Tasks: Define and describe hydraulics

(A) Describe the principles and theory of fluid power

(A) Explain fluid pressure and how it is measured

(A) Contrast pneumatics and fluidics

(A) Construct a basic fluid power circle

(A) Explain controlling liquids in mechanical devices

(A) Sketch out how refrigeration works

Competency: Apply principles of electricity

Tasks: Define terms associated with electricity

Explain principles of electricity

Name the parts of an atom

Describe magnetism and explain its importance to electric motors

(A) Calculate the electrical charge of electrons and protons

(A) Contrast electrical energy with othe energy forms

(A) Contrast electricity and electronics

Competency: Identify electrical power generation methods

Tasks: List sources of electrical power

List several types of power loads

Describe ways electrical energy is controlled

Discuss the present-day importance of steam in power and heat generation

Competency: Understand electrical circuits

Tasks: Explain electrical circuits and how they work

Identify the four basic components of a circuit

Define terms associated with electric circuits

Compare AC and DC systems

Competency: Identify basic electrical devices

Tasks: Explain how electric motors work

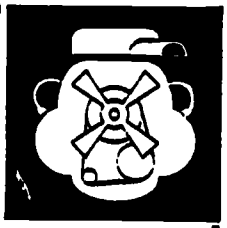
Identify common electrical devices and explain how they work

(A) Perform simple repairs and adjustments on an electro-mechanical system

(A) Analyze the performance of an electro-mechanical device

(A) Discuss solenoids and other electrical control devices

(A) Name important electrical sensing devices



Competency: Identify advanced uses of electricity

Tasks: Discuss important domestic applications of electricity

Discuss important commercial applications of electricity

(A) Define the role of electricity in communications systems

(A) Explain basic principles of lasers and fiber optics

(A) Describe how a laser works

(A) Explain the use of electronic sensors

(A) Explain the use of logic circuits

Competency: Identify environmental impacts of energy extraction and utilization

Tasks: Explain impacts of placer, strip, deep-shaft and evaporation mining

Discuss acid rain and its causes

Discuss the problem of tailing disposal, runoff, and reclamation

Discuss sources and impacts of thermal and air pollution

Discuss the sources and hazards of indoor pollution

Competency: Identify experimental and alternative energy systems

Tasks: Explain terms and principles associated with alternative energy systems

Describe use and limitations of wind, wave, solar, tidal, and hydro power

Explain the heat source of geothermal energy

Locate geothermal sources in Alaska

Explain biomass electrical generation

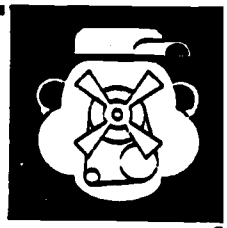
(A) State the advantages of post windmill design

(A) State the advantages of vertical rotor windmills

(A) Describe the effect of blade angle on a multi-vane windmill

(A) Describe a wind farm

(A) Discuss wind speeds necessary for wind powered electrical generation



Competency: Apply principles of light energy

Tasks: Define terms and explain principles associated with light energy

Contrast light with other energy forms

Explain the significance of the ozone layer and clouds to solar radiation

Explain the greenhouse effect

(A) Contrast incandescent and flourescent light sources

Competency: Identify uses of solar energy

Tasks: Describe solar power and heating systems

Explain cost-effective uses of solar energy in homes

Define active and passive solar collecting systems

Demonstrate heating with solar energy

Name the chief uses of solar panels

Relate convection, conduction, and radiation to solar energy

Name requirements for successful employment of solar energy

Explain the significance of new window glazing strategies

Describe solar water heating systems

(A) Explain solar principles as applied to outer space energy systems

(A) Categorize types of solar reflection

Competency: Identify heat energy principles

Tasks: Explain heat energy terms and principles

Contrast heat with other energy forms

Explain how heat is generated from natural gas, electricity, fossil fuels, and biomass

Identify ways to conserve heat energy

Competency: Identify principles of heat conversion and transfer

Tasks: Explain principles of heat conversion in gas, electricity, and microwaves

Explain the principles of heat transfer

Describe how heat is generated in an automobile

Name types of heat energy reservoirs

Explain conversion of geothermal energy to electricity

Define "hydrothermal", hot-dry rock, and "fracking"

Competency: Identify the principles of steam energy for power generation

Tasks: Explain steam energy terms and principles

Trace the development of the steam engine

Diagram main steps in steam engine operation

Name major classes of steam engines

Explain the difference between a steam piston and steam turbine engine

Name major uses of steam turbines

List four methods to produce steam

Diagram the power flow in stirling engines

Explain saturated and super heated steam

Competency: Identify principles of sound

Tasks: Explain sound terms and principles

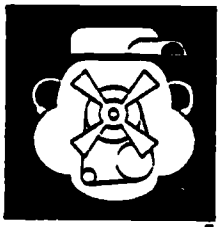
Contrast sound waves with other energy forms

Explain how sound energy is produced

Contrast pitch, frequency, amplitude and volume

Contrast recording methods for different examples of stored sound energy (tapes, records, etc,)

Define supersonic and ultrasonic



Name devices which utilize ultrasonic energy

(A) Identify the wave form by which sound energy is transmitted

Competency: Identify principles of radiation energy

Tasks: Contrast radiation with other energy forms

Define black body radiation (objects at night returning energy absorbed during the day), microwave radiation, and electromagnetic radiation

Competency: Identify principles of gravitational energy

Tasks: Explain gravitational energy terms and principles

Contrast gravitational with other energy forms

Identify sources of gravitational energy

Contrast advantages and disadvantages of gravity as an energy source

Explain how mechanical motion is created from gravitational energy

Explain how to utilize gravity to produce electricity with falling water

Define high head and low head

Explain how the water cycle represents potential energy

Explain how dams, reservoirs, and water towers store potential energy

Explain the gravity principle of ocean wave movement

Explain how ocean tides can be converted to electricity

Describe a gyroscope

Competency: Identify principles of nuclear energy

Tasks: Explain terms and principles associated with nuclear power generation

Compare fission and fusion

Contrast nuclear other energy forms

Identify fuels used to produce nuclear energy

Competency: Identify nuclear energy considerations

Tasks: Name human uses of nuclear energy

Describe use of nuclear radiation in medicine

Explain the problem of nuclear wastes

(A) Explain political and social ramifications of nuclear power generation

Competency: Identify how nuclear reactors work

Tasks: Contrast several types of nuclear reactors

Describe the purpose of control rods

Identify the heat source in a fission reactor

Discuss nuclear fusion as a future energy source

List ways fusion fuel (plasma) may be heated

Name technical problems associated with nuclear fusion

(A) Describe principles of a light water reactor

(A) Explain the effect of moderators

Competency: Identify principles of energy conversion

Tasks: Explain energy conversion terms, principles, and methods

Explain how energy is converted, transmitted, controlled, and applied

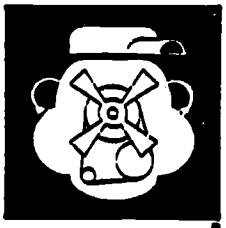
Contrast direct and indirect energy conversion

Explain the conversion of geothermal energy to electricity

Discuss geothermal energy impacts

Explain ways to convert wind and tidal energy to electricity

Explain the conversion of animal wastes to electricity



Discuss the conversion of:

a. wood fuel to heat
b. coal to heat
c. oil to heat
d. light energy to heat
e. light energy to electricity
f. mechanical energy to electricity
g. electrical energy to mechanical energy

(A) Discuss the indirect energy conversion process: electric to heat, light, and mechanical energy

(A) Explain the conversion of solar energy to electricity

(A) Explain the indirect energy conversion process of oil to heat to mechanical power

(A) Explain the indirect energy conversion process of nuclear to heat to mechanical power

(A) Explain the energy conversion principles of photosynthesis

Competency: Identify principles of energy transmission

Tasks: Explain energy transmission terms, principles and methods

Explain how electricity is transmitted

Define heat radiation

(A) Discuss how power is transferred through mechanical, fluid, and electrical devices

(A) Explain the importance of fiber optics to energy transmission

(A) Define conduction

(A) Describe the characteristics of a good electrical conductor

(A) Complete an experiment demonstrating energy transmission

(A) Explain ways that light energy is transmitted

(A) Explain ways that radiation energy is transmitted

(A) Describe principles of mechanical energy transmission

(A) Explain the use of gears and pulleys as a form of energy transmission

Competency: Identify principles of energy storage

Tasks: Explain energy storage terms, principles, and methods

Describe characteristics of chemical and mechanical energy storage

Describe tides in terms of energy storage

(A) Explain characteristics of capacitative energy storage

(A) Define characteristics of thermo-energy storage

Competency: Identify principles of chemical energy

Tasks: Contrast chemical energy with other energy forms

Define plants as energy sources

Define bio-chemical mixtures as energy sources

Define peizo-chemical as an energy source

Examine fossil fuels in terms of being chemical energy sources

Define batteries as energy sources

Identify types of chemical batteries

Identify the voltage, characteristics and use of chemical batteries

List dangers in handling batteries

Describe characteristics of common battery types

(A) Calculate the voltage, characteristics and use of several types of chemical batteries

(A) Describe chemical electrical generation

(A) Describe characteristics of nickel cadium batteries and silver oxide batteries

Competency: Use energy and power safely

Tasks: Describe safe practices for working with power systems, tools and equipment

Identify dangers associated with fossil fuel, hydro, and nuclear energy production, conversion, storage, transmission, and consumption

Competency: (A) Identify advanced applications of electro-mechanical technology

Tasks: Explain electro-mechanical terms, principles, and technologies

Survey a major electro-mechanical research and development project

Explain how more than one energy system may be employed in a single device

Discuss the applications of power as related to systems present in a device

Evaluate several electro-mechanical systems

Complete a power and energy system proposal

Explain principles of robotics

Competency: (A) Apply principles of pneumatics

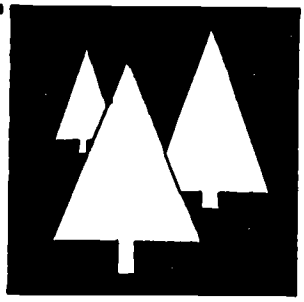
Tasks: Explain pneumatic terms and principles

Explain controlling gases in mechanical devices

Explain important hydraulic power systems and how they work

Explain ways of converting mechanical power to fluid power

Forestry and Logging



(A) Indicates Advanced Task or Competency

Competency: Identify the role of forestry products in modern society

Tasks: Define modern forestry terms, principles and methods

Describe the development of the logging industry in the United States

Describe the importance of the forest industry to Alaska's economy

Describe the history of Alaska's forests

List forestry products

Competency: Use forestry tools

Tasks: Describe the proper use and care of forestry tools and equipment

(A) Cable splice in an eye slice with a marlin spike

Competency: Work safely

Tasks: Define terms and explain principles related to forestry safety

Describe ways to prevent accidents

Explain the importance of having first aid skills

Competency: Identify the role of fires in modern forestry

Tasks: Define the terms associated with forest fires, such as wildfires and controlled burns

Explain the principles associated with fire ecology

Explain important fire prevention and control techniques

Explain controlled burning techniques

Explain how to construct fire lines and operate water pumping equipment

Explain safe fire-fighting practices

Competency: Complete a rough land survey

Tasks: Identify basic surveying terminology and principles

Use a hand compass

Pace and measure a given plot

Use a clinometer

Competency: Identify major commercial hardwood and softwood species

Tasks: Identify Alaskan tree species and their commercial value

Explain the terms and principles associated with tree growth

Competency: Cruise and scale timber

Tasks: Explain timber cruising and scaling terms and principles

Name tools and equipment needed for proper surveying and scaling

Calculate diameters of standing trees and logs

Calculate heights of standing trees and lengths of logs

Calculate gross and net volumes

Determine grades and defects of logs and timber stands

Competency: Identify timber harvesting techniques

Tasks: Identify logging terms, principles and techniques

Discuss state and federal logging laws

Develop a logging plan

Explain how to properly climb a tree or pole, set chokers, and load and haul timber

Competency: Plant trees

Tasks: Identify tree planting terms, tools, principles and methods

Plant seedlings

Competency: Identify raw materials used in forest product manufacturing

Tasks: Explain how forest products are processed

Match raw materials with end products in several types of wood manufacturing

Identify current or potential Alaska-manufactured wood products such as biomass energy production

(A) Properly use marlin spikes in cable splicing in an eye slice

Competency: Use a chain saw

Tasks: Describe and name the various parts of a chain saw

Explain saw, bar, and chain maintenance procedures

Explain chainsaw safety procedures and clothing for falling, bucking, carrying, transportation

Describe relevant fire regulations

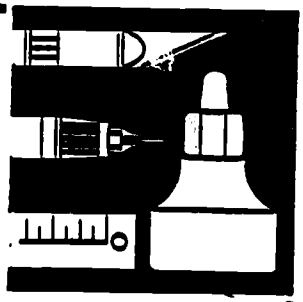
Competency: Identify forestry employment opportunities

Tasks: Describe jobs in forestry such as:

a. logging
b. timber grading
c. forestry naturalist
d. sawmill worker
e. law enforcement
f. recreation
g. road building
h. reforestation

Locate important timber-producing areas in Alaska

Graphics



(A) Indicates Advanced Task or Competency

Competency: Understand history of graphic communications

Tasks: List earliest forms of graphic communications

Describe the history and impact on communications of:

a. movable type and the printing press
b. cameras
c. computers

Summarize the history of graphics in American business

Competency: Identify the principles of graphics

Tasks: Describe graphics terms, principles, and techniques

Describe graphics equipment, tools, and materials

Competency: Identify the elements of design

Tasks: Explain design terms, principles and techniques

Competency: Identify typestyles and graphics

Tasks: Describe typestyles

Define:

a. font
b. point
c. type group
d. family of type
e. leading
f. picas
g. continous tone in line copy

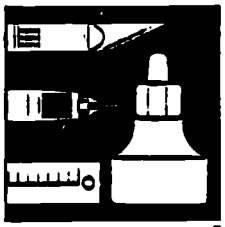
Explain the use of clip art, charts, and other types of graphics

Competency: Layout a project

Tasks: Create a thumbnail sketch

Create a rough layout

Identify and use a proportional wheel



Create a comprehensive layout

Describe the process of stripping

Competency: Identify printing supplies

Tasks: Describe types of printing supplies

Describe characteristics of printing inks

Describe types of paper used in printing

Describe various kinds of stencils and their solvents

Identify corrosive and flammable printing chemicals

Competency: Identify different printing processes

Tasks: Define terms associated with graphic printing processes

Identify materials, equipment, and techniques related to printing

Determine printing needs

Identify possible printing problems

Describe how to:

a. Create a lithograph
b. Silk-screen
c. Use the offset press
d. Block print
e. Letterpress
f. Make a rubber stamp
g. Gravura print
h. Use flexography
i. Ink jet
j. Relief print

Competency: Identify graphic production techniques

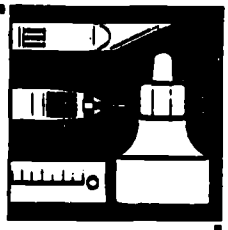
Tasks: Describe binding techniques

Demonstrate folding techniques

Describe how to figure paper cuts from parent stock

Define:

a. ruling
b. scoring
c. perforating
d. die cutting
e. signatures



(A) Bind a document

Competency: Store and duplicate graphics

Tasks: Describe ways to store and protect graphics

Describe methods of graphic reproduction

Competency: Work safely

Tasks: Identify graphics and printing shop safety procedures

Identify common shop hazards

Describe safe use of common graphics and printing tools and equipment

Competency: Identify the parts of a camera

Tasks: Define the principles of photography

Describe the function of:

a. the camera lens
b. the shutter
c. f-stop or aperture
d. lens cap
e. light meters
f. viewfinders

Describe important camera relationships such as:

a. F-stop and shutter speed
b. F-stop and depth of field

Explain how to care for cameras

(A) Demonstrate how to use precision photographic equipment

Competency: Identify types of cameras

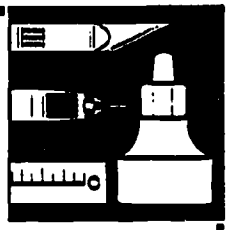
Tasks: Describe camera types such as box, folding, reflex, and process cameras

Explain the function of various camera lenses such as: wide angle, macro, long lens, and 2 X extender

Define single lens reflex

Contrast 35mm with cartridge-film and instant cameras

Discuss the function of home video cameras for family and business photography



Competency: Identify types and functions of films

Tasks: Define terms associated with film

Explain the principles associated with exposing and developing film

Define the ASA rating of film

Describe the common types of film and their uses

Name types of film used in process camera work

Describe the changes taking place on film during exposure

Describe how prints and slides are made

Competency: Use a camera

Tasks: Load film

Determine correct camera settings using light meter or film manufacturer's instructions

Set camera shutter speed and F-stop

Identify how to determine when film has all been used

Rewind and unload film

(A) Take pictures illustrating:

a. distracting background
b. placement of horizontal lines
c. formal photocomposition
d. informal photocomposition

(A) Use different focusing techniques including:

a. split image range finder
b. coincidental range finder
c. ground glass screen range finder

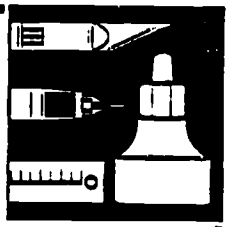
(A) Use a spot meter

Competency: Develop film and prints

Tasks: Explain developing terms, principles and techniques

Explain safety precautions

a. List the dangers in using photographic developing chemicals
b. Demonstrate proper storage of photographic chemicals
c. Explain proper methods of mixing developing photographic chemicals



Explain the purpose of darkrooms and safe lights

Competency: Identify careers in graphics

Tasks: Identify occupations in graphic arts

Describe use and importance of graphics in business, industry and government

Competency: (A) Identify terms and concepts integral to graphic communications

Tasks: Define graphic communications

Identify terms related to letterpress graphic technology

Describe areas of greatest technical advancement in graphic arts

Explain methods of graphic concept visualization

Explain the importance of graphic size and shape

Competency: (A) Use a computer for graphic illustrations

Tasks: Identify basic computer components

Identify applications of the computer in typesetting

Explain CAD (Computer-Assisted Drafting) terms, principles and techniques

Describe the use of computer keyboards

Describe how to space, align, fit copy and make orthographic projections

Competency: (A) Typeset copy

Tasks: Explain typesetting terms, principles and procedures

Identify the parameter parts of a typesetter

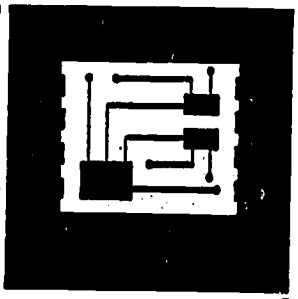
Identify proof reading symbols

Identify type sizes and styles

Explain the types of paper used in typesetting

Identify the proper ink for the printing process selected

High Technology



Competency: Understand computer technology

Tasks: Identify terms and principles associated with computers

Explain how a microcomputer works

Explain uses of computers in offices, schools, and business operations

Competency: Understand robotic technology

Tasks: Identify robotics terms and principles

Explain robotics safety practices

Identify uses for low, medium, and high technology robots

Explain the coordinate system defining a robot's movements

Identify robot parts and features

Discuss maintenance of robotic systems

Explain several robot end-effectors

Sketch out the "working envelope" for a robot

Describe robotic "pick and place", "point-to-point", "continuous path" operations and their applications

Discuss robotics' social and economic impacts

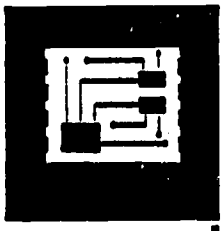
Competency: Understand Computer-Aided Drafting (CAD)

Tasks: Define CAD terms, principles and techniques

Explain the components of a CAD system

Explain basic two and three dimensional coordinates in the Cartesian system

Describe functions of a CAD software package



Competency: Understand Computer-Aided Manufacturing (CAM)

Tasks: Define automation

Define CAM terms, principles, and techniques

Identify parts of a numerical control system

Contrast numerical control (CN) systems with computer numerical control (CNC) systems

Identify terms related to CNC systems

Discuss interfaces between CAD and CAM systems

Competency: Understand satellite technology

Tasks: Explain satellite terms, principles, and technology

Review the history of satellite technology

Explain laws governing satellite communications

Explain the significance of the Clark belt

Describe the function of satellite system components including home satellite dishes

Competency: Use laser technology

Tasks: Explain laser terms, principles, and techniques

Follow safety procedures

Explain the various ratings of lasers

Explain characteristics of laser beams

Illustrate the spreading of the laser beam

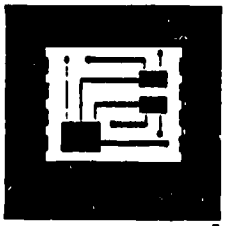
Split a laserbeam

Change the direction of the laser beam

Discuss fiber optics

Use the laser to transmit a signal (such as a voice signal)

Use a polarizer to vary the intensity of the laser beam



Competency: Use photovoltaic technology

Tasks: Identify photovoltaic terms

Explain the principles of photovoltaics

Determine the output parameters of a photovoltaic converter

Identify characteristics of silicon cells

Measure the efficiency of a photovoltaic converter

Competency: Identify jobs in high technology

Tasks: Describe jobs in:

a. computers
b. robotics
c. CAD
d. CAM
e. satellite technology
f. laser technology
g. photovoltaic technology

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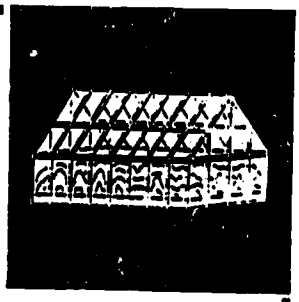
Horticulture



(A) Indicates Advanced Task or Competency

Competency: Identify local climatic conditions requiring special gardening procedures

Tasks: Determine length of growing season

Determine rainfall and air and soil temperature parameters during growing season

Determine plants which can be grown locally

Test soil

Determine gardening procedures for your locale

Competency: Identify the potential for subsistence and commercial agriculture

Tasks: Identify crops grown in your locale

Identify crops suitable for your locale

Identify markets for locally-grown food products

Identify food storage procedures such as root cellars

Competency: Plant a garden

Tasks: Select seed

Prepare soils and other media

Plant and transplant plant materials

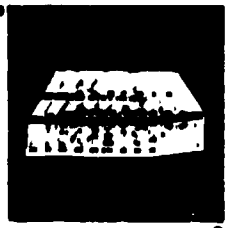
Fertilize and irrigate

Maintain irrigation system

Identify and control weeds, plant diseases and pests

Harvest crops

Prepare produce for sale, subsistence use, or storage



Competency: Plan and design a greenhouse

Tasks: Discuss the amount and intensity of light and heat necessary for plant growth

Determine light intensity

Determine the angle of incidence for a particular structure

Sketch a sun path diagram for a particular locale

Discuss greenhouse sunspace demands

Discuss supplemental lighting requirements for seedlings and mature plants

Discuss the value of interior greenhouse reflective surfaces

Contrast benefits of translucent and transparent glazing

Contrast light diffusing abilities of glazing such as: fiberglass, polyethylene, polycarbonates, acrylics, and glass

Describe the importance of air movement in greenhouses

Contrast ways to store heat in the greenhouse

Explain ways to protect greenhouse thermal mass from temperature extremes

Contrast different types of growing media

Identify ideal soil and water temperatures for various plants

Sketch several possible greenhouse designs and compare their advantages

Sketch out several ways to use available interior space

Compare advantages of raised beds

Discuss plant shading and plant microclimates

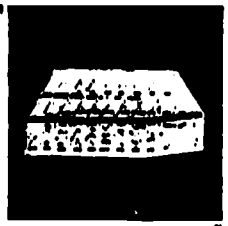
Complete the greenhouse floor plane

Plan propagation beds

Plan plant beds of proper depth and width

Plan plant arrangement and spacing

Discuss the greenhouse in terms of food and energy independence



Competency: Control greenhouse humidity

Tasks: Define relative humidity

Calculate the relative humidity for the locale

Explain ways to control greenhouse relative humidity

Competency. (A) Prepare a rich soil bed

Tasks: Locate a source of usable topsoil

Explain how to make and sterilize soil

Explain proper soil drainage

Explain the problem of salt and mineral buildup and how to avoid it

Test and adjust soil pH and fertility

Discuss nutrients important for proper cultivation

Discuss fertilization in terms of Liebig's Law of Minimum

Compare advantages of different bed strategies

Competency: (A) Control air movement and temperature in the greenhouse

Tasks: Explain expected plant growth responses

Discuss the problem of carbon dioxide depletion:

a. in a closed greenhouse
b. due to a lack of air motion

Discuss the importance of air exchange

Explain how to compost mulch to generate carbon dioxide

Competency: (A) Select crops for the greenhouse

Tasks: Explain how environment determines crops

List potential plant varieties

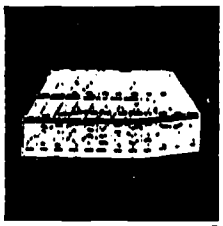
Select proper plant containers

Discuss the issue of pollination

Explain how to grow tomatoes using a spotlight

Keep accurate records of planting dates, species, varieties, and performance

Keep accurate records of expenses



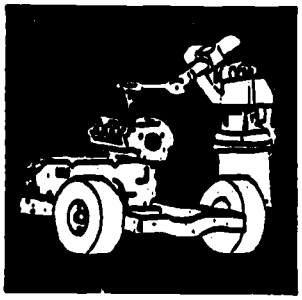
Competency: (A) Control pests and diseases in the greenhouse

Tasks: Discuss methods of proper pest and disease prevention

Contrast biological versus chemical controls

Explain advantages of certain lighting and planting strategies in the control of pests and disease

Manufacturing



(A) Indicates Advanced Task or Competency

Competency: Identify major concepts of manufacturing

Tasks: Explain manufacturing terms, principles, and techniques

Explain purchasing, distribution, packaging, labeling, and storing strategies

Identify important service occupations related to manufacturing

Explain the role of computers

Define and give examples of jigs and fixtures

Competency: Identify resources used in manufacturing

Tasks: Describe raw materials and energy resources used in manufacturing

Identify synthetic materials used in manufacturing and their sources

Explain processes that convert raw materials to industrial stock

Explain processes that recycle materials into industrial stock

Competency: Identify major steps in the manufacturing process

Tasks: Define the steps in manufacturing

Trace the development of manufacturing

Describe how economics effects manufacturing

Describe the process of mass production

Define "interchangeability of parts" and "economies of scale"

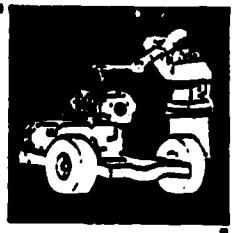
Identify environmental considerations in the manufacturing process

List reasons for consumer surveys and test marketing

Competency: Identify company organization strategies

Tasks: Define organizational terms and principles

Describe an organizational structure



Explain ownership terms such as corporation, partnerships, sole proprietor,and publically and privately-owned

Competency: **Identify the role of management in a manufacturing enterprise**

Tasks: Explain management's responsibilities to:

a. the company
b. employees
c. customers
d. the general public

Explain employee responsibilities

Competency: **Identify the function of research and development in manufacturing**

Tasks: Explain the role of research and development

Define and give examples of pure and applied research

Explain how new products are researched

Explain the significance of spin-offs

Name common products resulting from space-related research

Competency: **Calculate manufacturing problems**

Tasks: Describe manufacturing layout and measurement processes

Convert fractions to decimals and decimals to fractions

Convert standard dimensions to metric and metric dimensions to standard

Calculate amount of stock required in machine work

Calculate feeds and speeds

Calculate for angular and simple indexing

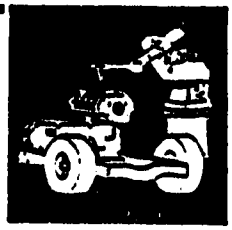
Calculate tap drill sizes

Calculate tolerances and allowances

Competency: **Assemble bench work**

Tasks: Identify terms and principles associated with bench work

Assemble or disassemble work with an arbor press



Bench file a work piece

Explain care for hand tools

Competency: Perform bench work

Tasks: Maintain a safe working environment

Saw materials

Thread with tap and die

Drill holes

Grind parts

Hand whet cutting tools

Hone a work piece

Inspect and change shop drive pulleys and belts

Install a helical coil wire insert

Lap surfaces

Locate holes with transfer screws and punches

Mark locations with a prick and center punches

Ream holes

Work and shape metal or wood

Polish metal or finish wood

Competency: Maintain precision machine parts

Tasks: Remove and install dowel pins

Remove and replace broken drills, taps, screws, and machine parts

Straighten work piece and arbor press

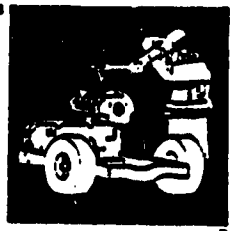
Competency: Operate a drill press

Tasks: Clean and lubricate the drill press

Mount a work on V-blocks

Counterbore and countertsink holes to specifications

Drill a hole to size



Drill a hole with an automatic feed on the drill press

Drill a work piece with a drill jig

Lap a hole to size

Ream holes to size

Competency: (A) Organize a manufacturing company

Tasks: Identify major steps in planning a business

Identify start-up capital needs and sources

Describe the relationship of manufacturing to big business

Develop an organizational chart

Identify major start up problems and their solutions

Competency: (A) Design a mass production project

Tasks: Discuss and choose a saleable product

Organize flow charts

Determine critical paths

Contrast company and industry standards

Identify appropriate drafting symbols

Interpret and work from multi-view drawings

Calculate missing dimensions

Sketch the work to be produced

Identify and explain the use of measuring and layout tools

Explain the importance of accuracy

Competency: (A) Plan and enter production

Tasks: Explain safety procedures

Tool up for production

Determine clearances and tolerances

Set up jigs and fixtures

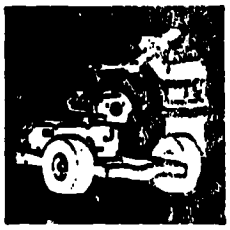
Set up an assembly line

Set up work stations and management positions

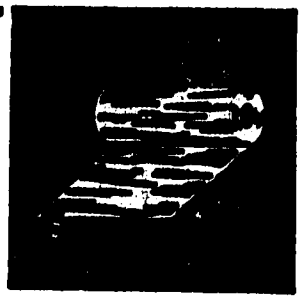
Build, inspect, and test prototypes

Modify processes as required

Establish and follow quality controls



Metals



(A) Indicates Advanced Task or Competency

Competency: Identify characteristics of commonly-worked metals

Tasks: Define the terms and principles associated with metallurgy

Trace the formation of a given metal product from ore extraction to product sale

Identify samples of common metals and metal ores

Explain heat flow and its application to bending and forming metals

Identify the appropriate metals for selected projects

(A) Differentiate between iron and steel

(A) Identify raw materials used in ferrous and nonferrous metals

(A) Describe qualities of materials made of aluminum or aluminum alloy

(A) List major manufacturing uses of iron and steel

(A) List the raw materials needed to make aluminum

(A) Identify properties which create the need for steel classifications and interpret data from resource information

Competency: Construct projects using shop drawings

Tasks: Read and follow metalworking specifications and directions

Measure and machine to accuracy specified

Sketch or draw a metal project plan

Measure angles to the nearest degree

Competency: Apply metalworking techniques

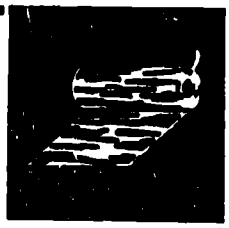
Tasks: Explain metalworking terms, principles, and techniques

Identify metalworking tools and their proper use and care

Identify metalworking rules and regulations

Identify the relationship between speed and feed

Describe the process of heat treatment with plain carbon steels



Identify methods for joining metal together

Interpret working drawings

Store and maintain all metalworking equipment

Utilize techniques for bench metalwork including drilling, tapping, bending, and fitting

Employ a variety of standard techniques for sheet-metalwork such as riveting, soldering, layout, bending, forming, and finishing

Operate the metal lathe including turning between centers, turning with a chuck, turning a taper, knerling, and drilling

Explain techniques for forging such as bending, shaping, fitting, and heat-treating

Cut mild steel with a gas cutting-torch

(A) Identify procedures for processing metals

(A) Use the spark testing technique to differentiate high carbon from low carbon steel

(A) Describe the casting process

Competency: Use appropriate welding technique

Tasks: Define the terms, principles and techniques associated with welding

Explain how to determine the appropriate welding technique for the materials

Explain the use of arc and gas welders for flat welding applications

Select proper arc welding electrodes

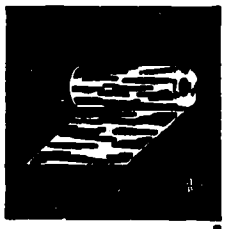
Describe dress and safety procedures for welding

Maintain welding tools

Prepare surfaces to be welded

Remove burrs and sharp edges with a file

Describe how to determine the quality of a weld



Competency: Calculate material costs

Tasks: Calculate material needs

List sizes, quantities, and unit and total costs

Competency: Use common fastening devices

Tasks: Describe different types of fasteners and their applications

Identify types and sizes of screws and rivets and their uses

Practice several common methods of clamping

Competency: Measure and calculate accurately

Tasks: Read common measurement tools such as:

a. Tape measures
b. Squares
c. Rulers
d. Protractors
e. Micrometers
f. Vernier gauge
g. Calipers

Use decimal and metric equivalents

Competency: Arc weld

Tasks: Identify all parts of an arc welding machine and related equipment

Identify a proper arc welding set up

Safely use arc welding equipment

Demonstrate stick welding techniques

Properly position and secure the cables and welding project prior to beginning arc welding

Select the proper amperage and current flow

Properly clean and prepare metals prior to arc welding

Select and use proper rods and flux

Position and secure the cables and welding project

(A) Safely weld overhead

(A) Safely weld butt, overlap, and T-joints in the flat, horizontal and vertical positions

(A) Identify electric welding processes commonly used in industry

Competency: Use oxy-acetylene welding equipment

Tasks: Select the appropriate welding or brazing process for shop projects

Identify all parts of an oxy-acetylene gas welding set up

Assemble and adjust an oxy-acetylene welding set and regulators

Follow the proper procedure for turning on and shutting down the oxy-acetylene equipment

Describe metals which are potentially hazardous

Keep a properly adjusted flame at the torch tip

Identify the uses and purposes of using flux materials

Choose the appropriate cutting tip

Make welds and cuts

Make accurate straight or curved cuts

Perform butt, overlap and "T" weld joints

Properly store and maintain welding equipment

Use brazing techniques

(A) Utilize drawings and measurements for oxy-acetylene and arc welding equipment

(A) Explain properties of different types of metals as affected by gas welding

Competency: Heat, form and bend metal

Tasks: Explain terms, principles, and techniques for heating, bending, and forming different metals

Explain forging techniques with mild steel

(A) Identify temperature of steel by color changes

Competency: Identify jobs in metalworking and welding

Tasks: Describe special training required for metalworking and welding

Describe entry-level in metalworking and welding positions

Identify the impact of automation, robots, and computerized assembly on the welding trades

Mining and Petroleum

Competency: Identify geological theories

Tasks: Discuss theories of the formation of the earth

Explain the layers of the earth including, crust, mantle, outer core, inner core

Discuss the size, shape, and average density of the earth

Differentiate between sedimentary, igneous and metamorphic rock

Explain the relationship between plate tectonics and mineral deposits

Explain the relationship between weathering processes and mineral deposits

Competency: Identify mineral location and extraction techniques

Tasks: Describe mining exploration, development, and processing

Differentiate between strip, pit, tunnel, placer and evaporation mining

Explain ways of pillaring mines

Explain ways to safely deal with explosives

Competency: Identify mining issues

Tasks: Discuss the importance of minerals to society

Trace the importance of gold to Alaska's development

Explain the reasons for building the Alaska railroad

Explain the relationship between mining and the growth of aviation and highways in Alaska

Explain how markets determine whether deposits are developed

Explain the Pacific Rim and its importance as a market for Alaska's minerals

Locate other mineral exporting nations on the Pacific Rim

Explain the competitive advantages and disadvantages of different nations on the Pacific Rim

Explain the importance of developing markets for Alaska's minerals

Name minerals important to Alaska's mining industry including:

a. sand and gravel
b. gold
c. coal
d. building stone

Explain the basic minerals used in building and construction, including:

a. iron
b. stone
c. gypsum
d. limestone
e. clay

Define strategic minerals

Identify mineralized areas in Alaska

Locate Alaskan seaports suitable for shipping minerals

Explain Alaska mineral transportation problems

Explain the importance of Alaska's coal reserves

Identify economic factors affecting marketing of minerals

Identify costs and other factors affecting choice of mining systems

Identify social and economic problems related to developing non-renewable resources

Explain environmental concerns related to mining in Alaska

Identify conflicts between mining and conservation interests

Competency: Identify jobs in the mining industry

Tasks: Explain the job of:

a. prospector
b. geologist
c. mining engineer
d. ore processing engineer
e. placer miner
f. heavy equipment operator
g. state and federal mining regulators

Competency: Identify the history of oil exploration

Tasks: Explain how oil is formed

Describe oil exploration techniques

Describe the relationship between the automobile use and the availability of cheap oil

Competency: Identify the importance of oil to Alaska's economy

Tasks: Name the major oil-producing nations

Describe the importance of oil to industrial economies

Locate important Alaskan oilfields

Describe the relationship between the Alaska pipeline and the Alaska Native Claims Settlement Act (ANCSA)

Describe the construction of the trans-Alaska oil pipeline

Identify the impact of state and local regulations and taxes on oil development

Describe the future of the oil and gas industry in Alaska

Explain the impact of nuclear power on the petroleum industry

Explain the impact of power from organic waste on the petroleum industry

Competency: Identify petroleum drilling and production techniques

Tasks: Explain oil and gas drilling techniques

Explain methods of blowout prevention

Name drilling innovations

Identify different types of wells

Describe how to plug a well

Explain how a well is completed

Explain the factors determining the life of oil wells

Name ways to control production

Identify ways to stimulate production and enhance oil recovery

Competency: Identify the importance of alternative fuel development

Tasks: Explain the importance of increasing energy production and finding new energy sources

Explain the importance of oil shale and tar sands to expanding energy sources

Explain how coal is liquified for fuel

Explain the impact of renewable energy sources on the petroleum industry

Explain the impact of solar, wind, and ocean energy sources on the petroleum industry

Explain the impact of alcohol fuel and geothermal power on the petroleum industry

Identify the value of petroleum products in environmental and health research

Discuss conservation's role as an energy source

Competency: Identify environmental impacts of energy extraction

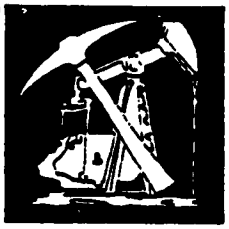
Tasks: Explain ways the petroleum industry needs to protect the environment including:

a. reducing emissions and odors at refineries
b. producing low-sulfur heating oil and residual fuel oil
c. returning water to rivers or streams at the same or an improved purity
d. reducing refinery discharges
e. preventing, controlling, cleaning up, and monitoring oil spills
f. reimbursing victims of oil spills
g. preventing and controlling offshore blowouts

Explain ways to prevent oil spills

Identify environmental safeguards in pipelines and refineries

Identify the relationship between burning fossil fuels and the greenhouse effect



Competency: Identify petroleum transportation methods

Tasks: Describe marine, road, and rail transportation methods

Describe pipeline systems and their operation

Contrast types of pipelines, including gathering lines, crude oil trunk lines, and product trunk lines

Competency: Identify petrochemical refining and manufacturing processes

Tasks: Identify petrochemical manufacturing terms and principles

Explain refining processes

Identify the petrochemical "building blocks"

Explain the manufacturing of petrochemicals

Identify methods of waste control

Competency: Identify petroleum products and their uses

Tasks: Describe the use of petroleum products such as:

a. gasoline
b. diesel fuels
c. fuel oils
d. asphalt
e. jet fuel
f. plastics
g. geotextiles
h. other consumer products

Identify the manufacture and uses of kerosene

Identify the manufacture and uses of liquefied petroleum gas (LPG)

Identify the manufacture and uses of aviation gasoline

Describe the issue of petroleum product quality

Competency: Identify methods of marketing oil products

Tasks: Describe moving oil products to market

Explain the issue of intermediate stops such as terminals and bulk plants in moving oil products to market

Explain the business of gasoline retailing

Explain the marketing of other petroleum products

Competency: Identify jobs in the oil industry

Tasks: Explain how to apply for a job/training in Alaska's oil and gas industry

Explain how to enroll in the Alaska Petroleum Extension Program

Describe the job of:

a. petroleum engineer/engineer's aide
b. operator
c. instrument technician
d. drilling/floorhand (roughneck)
e. maintenance personnel

Small Engine Maintenance

Competency: Work safely

Tasks: Dress appropriately for small-engine work

Explain the proper use of specialized tools such as bearing drivers, oil-seal pullers and drivers, wheel pullers and pulley pullers, and torque wrenches and spanner wrenches

Identify shop emergency, first-aid, and clean-up procedures

Competency: Maintain electrical and ignition systems of small engines

Tasks: Identify terms and principles associated with the operation and maintenance of small engine electrical and ignition systems

Describe the function of electricity in the operation of small engines

Explain the function of ignition components such as:

a. sparkplug
b. coil
c. points or sensor coil
d. condenser
e. flywheel magnet
f. capacitance discharge systems
g. cam

Contrast ignition systems such as electronic or magneto

Explain timing

Test and troubleshoot ignition components such as coils, plugs and condensers

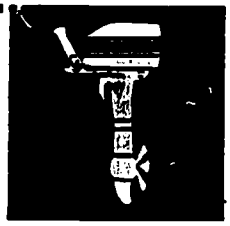
Competency: Maintain fuel systems common to small engines

Tasks: Identify terms and principles associated with operating and maintaining fuel systems

Identify fuels and mixtures for two-cycle, four cycle, and diesel engines

Diagram small-engine carburetors, fuel pumps, filters, connectors, lines, and fittings as well as contrasting the flow of fuel from carburetor to combustion area in one and two-cycle engines

Identify, adjust, and repair throttles and shift controls



Disassemble, reassemble, and adjust carburetors

Identify and explain governors

Identify carburetor features and functions including:

a. choke
b. throttle butterfly
c. venturi
d. high speed needle or orifice
e. slow speed needle
f. float or diaphragm metering assembly
g. inlet needle valve

Contrast ways fuel can be delivered to the carburetor

Troubleshoot and repair small engine fuel pumps, filters, connectors, lines and fittings

Competency: Maintain lubrication systems used in two- and four-cycle small engines

Tasks: Identify terms and principles associated with operation and maintenance of lubrication systems

Describe the role of lubrication

Describe the effects of lubrication system failures

Contrast the properties of common small engine lubricating engine oils

Contrast small engines lubrication systems

Identify and contrast the applications of a variety of bearing types including:

a. ball bearings
b. roller bearings
c. needle bearings
d. babbit or bushing bearings
e. thrust washers or bearings

Troubleshoot bearing and lubrication failures

Competency: Use engine manuals and parts lists

Tasks: Describe how to use engine manuals and parts lists

Locate information in small-engine manuals such as:

a. engine specifications
b. repair procedures
c. part numbers, prices, and sources

Calculate prices from parts lists and shipping costs

Perform small engine repair operations by following repair manual instructions

Competency: Use small engine fasteners

Tasks: Identify small engine fastener, terms, types, and principles

Compare the size, strength, and applications of bolt and machine screws, washers, lock washers and rings, screws, pins, keys, and nuts commonly utilized in small engines

Identify thread sizes and types

Properly drill and tap as needed

Use grease and "lock-tight" on bolts and other fasteners

Competency: Use appropriate gaskets and seals

Tasks: Explain gasket and seal terms and principles

Identify the types of gasket materials used in small engines

Identify and replace "O" ring and oil seals

Competency: Understand two- and four-cycle engines

Tasks: Contrast two- and four-cycle engines

Describe proper oil and gas mixing and storage procedures

Describe winterization procedures

Describe diagnostic tests and routine maintenance

Explain the role of cooling systems and the consequences of their failure

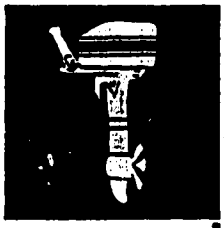
Explain the functions of crankcase vacuum and reed valve operation

Explain intake and exhaust valve mechanical systems and their significance

Competency: Understand diesel engine operation and repair

Tasks: Explain diesel engine terms, principles, and technology

Contrast basic engine characteristics of diesel and gasoline engine



Describe compression in diesel engines

Contrast combustion in diesel and gasoline engines

Competency: Install small engines

Tasks: Follow manufacturer's instructions

Secure small engines with bolts before testing

Install muffler assemblies

Replace protective guards on chains, gears, shafts or flywheels before operating

Competency: Maintain and repair small marine engines

Tasks: Identify terms and principles associated with marine engine use and maintenance

Explain the effects of corrosion

Explain corrosion prevention and repair procedures

Identify mechanical and electrical parts unique to outboard engines such as:

a. skegs
b. cavitation plates
c. lower units
d. water pumps
e. water intakes
f. exhaust housings
g. zinc plates
h. trim tabs
i. shear pins

Explain the role of prop pitch and diameter in performance

Competency: Troubleshoot small engines systematically

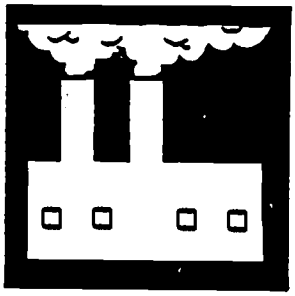
Tasks: Explain systematic approaches to troubleshooting engines and engine systems

Competency: Describe career opportunities in small engine repair

Tasks: Describe entry-level positions

Describe personal traits and training requirements

Technological Impacts



Competency: Identify technological impacts of highways

Tasks: Describe the loss of farm lands to highways

Discuss how a highway can impact an area

Explain changes in human interactions when remote areas become accessible by road

Explain changes in wildlife populations when areas become accessible by road

Competency: Identify technological impacts of communication

Tasks: Describe how a village or town changes with the introduction of telephone and television

Explain the impact of "instant mail" and computer communications on society

Describe the use of satelite communications

Competency: Identify social concerns relative to production

Tasks: Explain how the availability of work affects communites

Identify the social changes in Alaska which are likely to result from the industrialization of Alaska

Competency: Identify conservation concerns

Tasks: Explain conservation

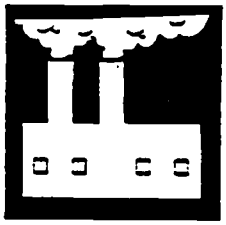
Explain how the recent creation of national parks, monuments, and wildlife refuges has affected Alaska's industry

Explain various uses of Alaska's native lands in relation to subsistence and revenue production

Competency: Identify social concerns relative to inventions

Tasks: Explain how the introduction of aircraft, high-powered rifles and ATV's has affected Alaskans

Discuss use of new inventions in Alaska such as hydrofoils in Southeast or high-speed rail transportation in the Railbelt



Competency: Identify effects of air pollution

Tasks: Define types of pollution

Identify reasons pollution is often ignored instead of alleviated

Relate cancer and other diseases with industrial pollution

Compare the amount of pollution produced by various types of fuel

Describe the chemical reaction that forms smog

Contrast smog and ice fog

Locate areas prone to smog in the United States and Alaska

Identify effects of smog

Name polluting particulates

Describe the role of wood stoves in air pollution

Discuss sources and effects of indoor air pollution

Describe how agricultural practices contribute to air pollution

Competency: Identify acid rain concerns

Tasks: Describe terms and principles associated with acid rain

Explain the water cycle

Describe the significance of acid rain

Explain factors that compound the problem of acid rain

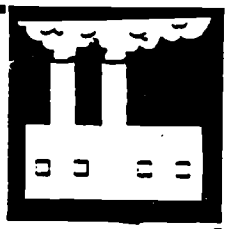
Identify geographical areas most affected by acid rain

Competency: Identify effects of thermal pollution on lakes and streams

Tasks: Identify terms and principles associated with thermal pollution

Explain why power plants produce waste

Identify ways that waste is dissipated in modern power plants and industrial processes



Competency: Identify impacts of power generation

Tasks: Explain impacts of:

a. coal-generated power
b. nuclear-generated power
c. using wastes for power generation
d. using petroleum-based power generation

Explain impacts of alternative methods of power generation such as:

a. wind generation
b. ocean power
c. biomass power
d. hydro power

Competency: Identify ways to conserve natural resources

Tasks: Describe alternatives to non-renewable energy sources such as synfuel or gasohol

Describe substitutes to traditional sources of materials such as using plastic for copper pipe

Describe the limitations of using substitutes

Describe new technologies which help conserve resources

Competency: Identify ways to conserve energy

Tasks: Identify the role of mass transportation in energy conservation

Identify the effect of car pooling and energy efficient automobiles

Identify the effect of tuning automotive engines, replacing air filters, and properly inflating tires on energy conservation

Identify the effect of upgrading house insulation on energy conservation

Identify the role of public education on energy conservation

Competency: Identify ways to control hazardous wastes

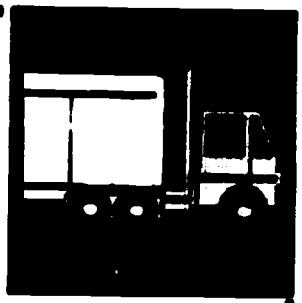
Tasks: Identify several types of hazardous wastes

Explain ways to minimize production of hazardous wastes

Explain possible effects of improper disposal of hazardous wastes

Name possible safe ways to transport and dispose of hazardous wastes

Transportation



Competency: Understand the importance of marine shipping to Alaska

Tasks: List major types of marine transportation

Describe inland waterways in the United States

Locate the world's major sealanes on a map

Locate Alaska's ports on a map

Locate the Inside Passage and Alaska's navigable rivers on a map

Describe the historical importance of marine shipping to Alaska

Explain the purpose and significance of the Jones Act and other shipping regulations

Explain the advantages of container shipping

Describe longshoreman jobs in Alaska

Discuss the potential for more shipping jobs due to increased Alaskan exports to Pacific Rim Markets

Competency: Understand the importance of land shipping to Alaska

Tasks: Describe historical and contemporary transportation to Interior, Northern, Western, and Southwestern Alaska

Describe the construction of the Alaska highway

List and locate surface rail systems

Locate Alaska's major highways on a map

Describe importance of commercial truck transport

Competency: Identify ways of transporting hazardous materials

Tasks: Explain safety concerns related to transporting hazardous materials

Identify hazardous materials currently being transported in Alaska

Describe recent accidents involving the transportation of hazardous materials in Alaska

Describe ways to safely transport hazardous materials by rail, truck, ship and air

Competency: Apply aerodynamic principles

Tasks: Explain aerodynamic terms, principles, and techniques

Sketch a cross section of an airplane wing

Explain Bernoulli's principle and airfoil lift with moving air

Relate airplane wing shape to angle of attack

Explain air current eddies

Explain skin friction, drag, and airspeed

Identify design characteristics which contribute to skin friction and lift

Contrast sub- and supersonic aircraft designs

Identify the purpose of wind tunnels

Explain how designers improve aircraft efficiency

Explain the basic operation of the roter-vane, piston, turbine, and jet aircraft engines

Explain aircraft safety considerations and procedures

Competency: Understand the importance of air transportation in Alaska

Tasks: Locate important Alaska air transportation centers on a map

Compare the costs of air shipping with those of surface transportation in Alaska

Name major Alaskan communities not on the state road system

Describe the issue of subsidies for air transportation in Alaska

Competency: Identify alternative methods of transportation

Tasks: Locate the world's high-speed rail systems

Describe possible contemporary uses of wind for transportation

Trace the development of supersonic transports (SST's)

Describe the "Orient Express" (high-speed space transporter)

Competency: Identify the characteristics of shipping jobs

Tasks: Explain the job of:

a. shipping supervisor
b. dispatcher
c. rate clerk
d. sales representative
e. maintenance man
f. truck driver
g. handler
h. warehouseworker/foreman
i. delivery
j. security

Competency: Identify jobs related to highway transportation in Alaska

Tasks: Describe jobs in:

a. transportation-oil industry
b. traffic engineering
c. licensing drivers
d. traffic enforcement
e. traffic court
f. recycling
g. traffic safety
h. automotive sales and service
i. highway construction and landscaping

Describe trucking jobs:

a. tractor driver
b. tractor owner/operator
c. dispatching and warehousing

Competency: Identify jobs related to air travel

Tasks: Describe airline industry jobs in Alaska

Explain the training required for these jobs

Competency: Identify jobs in tourism

Tasks: Describe jobs:

a. on cruiseships
b. in boat and aircraft charter operations
c. in tour bus operations

Wiring and Plumbing

(A) Indicates Advanced Task or Competency

Competency: Work safely

Tasks: Describe safe procedures for working with electricity

Locate safety equipment, escape routes and emergency exits

Demonstrate the safe use of mechanical equipment

Describe the importance of wearing safety goggles, aprons, and shoes

Competency: Use hand and power tools safely

Tasks: Identify tools utilized in house wiring assignments including specialized varieties of pliers, strippers, wrenches, saws, and drills as well as reamer, brace, conduit bender, and electrical tester

Describe proper hand and power tool use

Describe capabilities and applications of common electrical tools

Name common wiring materials and discuss their applications

Competency: Wire safely

Tasks: Explain safe wiring principles and techniques

Identify and explain applicable building and electrical codes

Splice wires utilizing mechanical connectors

Describe and execute Western Union, tap, and pigtail solder splices

Follow standard grounding procedures

Prepare and install an electrical service entrance and service panel

Install wiring for standard outlet configurations including split-wired outlets

Install lighting circuits including switch-controlled and flourescent lights

(A) Read kilowatt-hour meters and calculate corresponding utilities charges

(A) Install a main electrical panel and single-pole and double-pole circuit breakers

(A) Wire a variety of common household electrical devices including photo-electric switches, timer circuits, dimmer switches, and thermostats

(A) Discuss procedures for wiring outlets to household appliances including portable appliances such as radios, stationary appliances such as washing machines, and fixed appliances such as water heaters

(A) Compare the materials and procedures for outdoor and indoor wiring

(A) Calculate circuit loads

(A) Design and layout hypothetical circuits for a house so as to minimize the possibility of electrical overload

(A) Layout household lighting circuits in accordance with appropriate electrical codes including NEC

(A) Layout a wiring plan for a cabin or other small residential structure

(A) Estimate the materials and costs associated with wiring plans

(A) Install electrical metallic tubing and flexible conduit for joining circuit boxes

(A) Install electrical metallic tubing in accordance with electrical codes including NEC

(A) Install and test motor-starting equipment

Competency: Apply plumbing principles

Tasks: Explain plumbing terms, principles, and methods

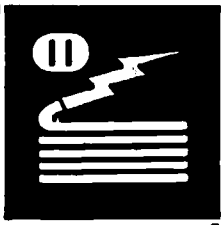
Explain the purpose and history of plumbing systems

Sketch isometric drawings of water and wastewater systems for multi-story structures

Describe relevant safety practices, such as insuring adequate ventilation when working with volatile and toxic compounds and preventing fires when working with torches and candles

Identify all applicable building and plumbing codes

Explain how to insulate plumbing systems and protect from temperature extremes



Competency: Make proper plumbing measurements

Tasks: Make an end to center measurement

Strike a straight line on a level surface using a chalk line

Make center to center, face to face, and back to back measurements

Grade a length of pipe with a level and with a hose

Measure using the plumb bob and rule

Competency: Repair home plumbing

Tasks: Replace:

a. basket strainer
b. water closet
c. faucet washer and seat
d. lavatory faucet
e. kitchen sink trap
f. ball cock
g. flush valve
h. lavatory trap
i. tank gasket
j. kitchen sink faucet
k. PO plug
l. tub shoe and overflow
m. clogged drains and sewer

Competency: Install copper pipe

Tasks: Identify terms and principles associated with copper pipe

Clean copper pipe, copper tube, and fittings

Bend copper pipe

Cut copper tubing and pipe with tubing cutters and hacksaws

Flare copper tube using hammer-type and screw-type flaring tools

Assemble a torch kit

Bend copper tube using lever-type bender

Prepare a copper joint using:

a. compression fittings
b. flare fittings
c. a copper solder joint
d. silver solder copper joint

Test system

Competency: Install plastic pipe

Tasks: Saw plastic pipe

Cut plastic pipe using tubing cutters

Prepare a:

a. polyethylene plastic tube joint
b. solvent weld plastic pipe joint

Test system

(A) Prepare a flare fitting plastic tube joint

Competency: Support and hang pipe

Tasks: Identify plumbing codes and manufacturing instructions

Strap pipe using pipe straps

Install backing boards for fixtures

Install toggle bolt anchor

Competency: Replace fixtures

Tasks: Describe how to repair or replace:

a. a tank-type water closet
b. a dishwasher
c. a water heater
d. a kitchen sink
e. a flush valve type water closet
f. a garbage disposal
g. a tub and shower valve
h. a bathtub
i. water softener

Competency: Identify jobs in plumbing and wiring

Tasks: Describe entry-level positions in trades involving plumbing and electrical wiring

Describe the jobs of construction and maintenance electrician and plumber

Woodworking

(A) Indicates Advanced Task or Competency

Competency: Work safely

Tasks: Describe safe shop procedures

Locate safety equipment, escape routes, and emergency exits

Demonstrate the safe use of mechanical equipment

Describe the importance of wearing safety goggles, aprons, respirators, and shoes

Competency: Identify woodworking principles

Tasks: Describe woodworking terms and principles

Describe wood drying and curing techniques

Explain lumber processing, grading, and selection

Calculate board feet required for a specified project design

Identify, compare, and use a variety of layout and measurement tools

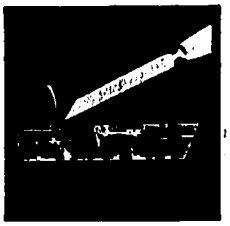
Describe the importance of proper planning and drafting

Name sources for obtaining woodworking project plans

Competency: Use and maintain hand tools

Tasks: Describe how to use and maintain:

a. hammers and mallets
b. hand, coping and miter saws
c. hand and special purpose planes
d. spokeshaves, draw knifes, and scrapers
e. hand drills, bits, braces, and drill presses
f. files, rasps and abrasive papers
g. chisels and carving tools
h. vises
i. staple guns
j. countersinks



Competency: Use and maintain power tools

Tasks: Describe how to use and maintain:

a. hand-held power tools including the sabre saw, power drill, and portable circular saw
b. radial arm, band, and circular table saws
c. sanders
d. lathes
e. turning chisels
f. drill presses
g. power grinders and jointers
h. planers or large sanders

Competency: Complete a basic woodworking project

Tasks: Develop and follow written plans

Calculate materials

Use measuring devices including tapes, rules, and calipers to specified accuracy

Plan, layout, measure, cut, fit and install optimally

Adapt the written project plan as necessary during construction

Describe, select, and use a combination of wood joining methods, including dowels, pins, and clamps and glue

(A) Use corner irons and T-plates

(A) Identify, describe, and utilize a variety of joints including miter, dado, lap, butt, dovetail joints, mortise and tenon and other cabinetry joints

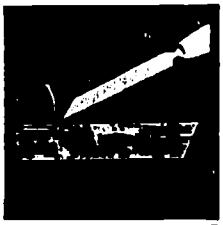
(A) Use hand screws, bar clamps, C-clamps, miter clamps, and spring clamps

(A) Lay out irregular shapes, curves, and geometric forms in wood

Competency: Identify woodworking career opportunities

Tasks: Describe entry-level positions in cabinet and furniture making and construction trades

Discuss the application of woodworking skills to marine and residential restoration and repair projects



Competency: (A) Complete an advanced woodworking project

Tasks: Develop written plans and designs after consulting several sources

Calculate materials

Draw up a bill of materials

Select, measure, lay out and cut materials accuarately and optimally

Lay out irregular shapes, curves, and geometric forms

Use saws, lathes, planes, reamers, drills, and routers

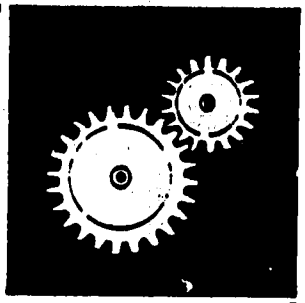
Explain how to use a variety of joints including miter, dado, lap, butt, dovetail, mortise, tenon and other cabinetry joints

Select and use a combination of joinery methods such as screws, pins, hinges, glues, and dowels and bar, C, miter, and spring clamps

Use corner irons and T-plates

Adapt the written project plan as necessary during construction

Advanced Principles of Technology



This course is a self-contained curriculum in which students will learn the principles of technology and how to apply those concepts to the mechanical, fluid, electrical and thermal energy systems found in technological devices.

The curriculum was developed through a multi-state consortium. Materials for this course include instructional guides for the teacher and student and student and demonstration lab stations.

Vendors who supply the Principles of Technology materials include:

Broadhead-Garrett Company
4560 East 71st Street
Cleveland, OH 44105
(216) 341--0248

Energy Concepts, Inc.
3254 North Kilbourn
Chicago, IL 60641
(312) 283-4422

Sargent-Welch Scientific Company
P.O. Box 1026
Skokie, IL 60077
(312) 677-0600

Scientific Labs, Inc.
P.O. Box 803788
Houston, TX 77280
(713) 464-6068

Competency: Apply the principles of force as related to different systems

Tasks: Identify the components of force in a mechanical system

Identify the components of pressure in a fluid system

Identify the instruments of temperature in a thermal system

Identify the force of voltage in an electrical system

Calculate force applications in different systems

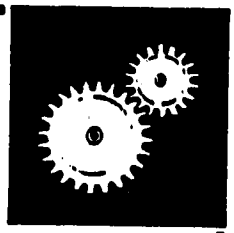
Competency: Identify the principles of work as related to different systems

Tasks: Explain the work done by winches and pulleys in a mechanical system

Explain the work done by pistons and pumps in a fluid system

Describe the work done by motors and solenoids in an electrical system

Calculate work applications in different systems



Competency: Relate principles of "rate" in different technological systems

Tasks: Measure linear and angular rate in different mechanical systems

Measure liquid flow and gas-flow rates in fluid systems

Measure current and frequency in a thermal system

Determine heatflow and cooling rates in a thermal system

Calculate rate in different systems

Competency: Apply principles of resistance in different scientific systems

Tasks: Define friction and its properties

Explain how lubricants reduce friction

Explain how streamlining reduces air drag

Describe resistance in a fluid and air system

Use ohms law to determine resistance in an electrical system

Measure resistance in a thermal system

Explain the importance of proper insulation in a thermal system

Calculate resistance in different systems

Competency: Apply principles of energy used in different technological systems

Tasks: Describe energy in a mechanical system

Measure potential energy in a mechanical system

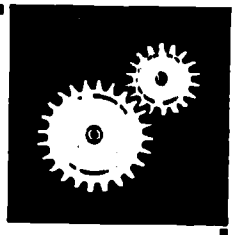
Measure stored energy in a hydraulic system

Define the use of compressed energy in a pneumatic system

Describe energy in an electrical system

Explain energy and temperature transfers as they relate to thermal systems

Calculate energy of different systems



Competency: **Apply the principles of power as related to different systems**

Tasks: Identify linear and rotating power in a mechanical system

Describe hydraulic power in a fluid system

Describe air power in a pneumatic system

Measure the amount of electrical energy in an electrical system

Explain the efficiency of motors and generators in an electrical system

Calculate power in different systems

Competency: **Apply the principles of force transformers in different systems**

Tasks: Contrast the force transformers in a linear mechanical system

Define the types of force transformers in a rotational mechanical system

Describe the use of force transformers in an electrical and hydraulic systems

Explain pressure intensifiers in fluid systems

Calculate force transformers in different systems

IV
Course Descriptions

Course Descriptions

The brief course descriptions provide conceptual frameworks for educational planners that seek to design and implement a balanced program in industrial education. Teachers can use these descriptions to organize course offerings in industrial education. These descriptions are examples of content organization and are too brief for purposes of program approval. Local schools will need to be much more definitive regarding the content of their courses than is reflected in these course descriptions.

Course: Industrial Education I, II, (etc.)
Length: One Semester/One Year
Grades: 6-12

Industrial Education is a course(s) which provide students with exploratory experiences and basic occupational skills in several industrial education areas. The specific course content of industrial education should be based on the employment potential in the local community, region and state.

The number of units included in an industrial education course will depend on the desired depth for each unit, and should be between four and eight units for a one year course.

Course: Advanced Principles of Technology I
Length: One Year
Grades: 11-12

Advanced Principles of Technology is a course in applied physics for those who plan to pursue careers as technicians. It is a course that blends an understanding of basics and principles with practice and builds a firm foundation for understanding technology. The curriculum for this program was developed through a multi-state consortium and is available from the Vocational Materials Library.

The content of Advanced Principles of Technology I is made up of the following seven units: Force, Work, Rate, Resistance, Energy, Power, and Force Transformers.

Course: Advanced Principles of Technology II
Length: One Year
Grades: 12

The second level of Advanced Principles of Technology builds upon the principles learned in the first course. It is a course that blends an understanding of basics and principles with practice and builds a firm foundation for understanding technology.

The content of Advanced Principles of Technology II is made up of the following seven units: Momentum, Waves and Vibrations, Energy Convertors, Transducers, Radiation, Optical Systems, and Time Constants.

V
Curriculum Analysis Matrix

Curriculum Analysis Matrix

Identified Competencies by Course Offerings

This competency checklist should be used by teachers in identifying competencies to be included in specific classes in industrial education. This checklist is a curriculum analysis tool for use by teachers in assigning responsibilities for the competencies of a total industrial education program.

All courses taught in the industrial education program are identified in the columns at the top of the matrix. The individual competencies can be allocated to specific courses. One method for analyzing the competency list is to assign letters where the competency will be introduced (I), taught (T), or mastered (M). Curriculum sequences can be organized through this approach.

To assist industrial education teachers to reinforce basic skills instruction, competencies have been cross-referenced with the following academic areas:

Math (M)	Science (S)
Social Studies (SS)	Language Arts (LA)

This will assist local school districts in awarding cross-credit (academic credit) for participation in vocational classes they deem appropriate.

The following checklists are also cross-referenced with the Job Training Partnership Act pre-employment competencies and student leadership competencies. The Job Training Partnership Act provides funds to train economically disadvantaged youth to enter and succeed in employment. Each Private Industry Council responsible for administering these funds adopted youth pre-employment competencies as one of the measures for positive termination for program participants. The other measures are attained through unsubsidized employment, or through another training program.

The following categories of work-related knowledge must be evaluated and measured in the course of a participant's enrollment in a JTPA program:

1. Pre-Employment Competencies, which require the participant to demonstrate the skills and knowledge necessary to identify career objectives, seek and obtain employment and understand job performance.

2. Work Maturity Competencies, which require the participant to demonstrate the ability to apply skills in a training position.

3. Educational Skills Competencies, which require the participant to demonstrate basic computation and communication skills necessary to enter the labor market.

4. Occupational Skills Competencies, which require that the participant demonstrate proficiency in those skills necessary to maintain employment in a specific occupation or occupational cluster.

The pre-employment and work maturity competencies have been specifically cross-referenced in this curriculum so that industrial education instructors could specify where these competencies are integrated into the curriculum.

These youth competencies were identified by the Vice Presidents of the Task Force on Youth Employment, Private Sector/Education Roundtables: Summary Report 1979 as critical elements for employability of the nation's youth.

Student leadership programs are designed to be an integral part of the curriculum. The competencies are reinforced by student participation in approved student organizations such as Vocational Industrial Clubs of America. The student leadership competencies have been cross-referenced in this handbook to assist the industrial education instructor identify specifically where these competencies will be taught.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

Vocational Industrial Clubs of America (VICA) is for students enrolled in secondary and postsecondary vocational courses in trade, industrial, technical and health education.

Through planned club activities, VICA develops the "whole" student, social and leadership abilities as well as vocational skills. The VICA motto is "Preparing for Leadership in the World of Work." VICA goals include:

- Foster an understanding of the functions of labor and management organizations and a recognition of their interdependence.
- Foster respect for the dignity of work.
- Relate school experiences to a young person's search for meaning, identity and achievement.
- Teach young people how to live and work with others...to accept and be accepted.
- Offer activities that complement occupational skill development.

- Create interest in and stimulate favorable community response to trade, industrial, technical and health occupations education.
- Promote high standards in work ethics, craftsmanship, scholarship and safety.
- Help students understand their roles in a technological age.

Alaska VICA, chartered in 1973, serves about 140 members in 10 chapters. The national organization is located in Leesburg, Virginia.

KEY

M	Math
SS	Social Studies
S	Science
LA	Language Arts
*	Pre-Employment Competencies
+	Student Leadership Competencies

Recommended Competencies by Course Offerings

Competencies

		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
	EMPLOYABILITY SKILLS						
* + LA	Identify career choices						
* SS	Identify jobs using industrial education skill training						
* + SS LA	Identify employment opportunities						
* + LA	Prepare a resume and job application						
* + LA	Write a cover letter						
* + LA	Prepare for an interview						
* LA	Follow up the interview						
* +	Dress appropriately on the job						
S SS	Prevent work-related injuries						
* +	Be reliable and dependable						
* +	Maintain good personal relations						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
* +	Be honest						
* +	Demonstrate initiative and productivity						
* +	Be assertive						
* +	Demonstrate work maturity						
*	Identify personal responsibilities related to employment						
* S	Maintain good health for effective job performance						
* +	Identify employee rights and responsibilities						
SS	Follow OSHA guidelines						
* + LA	Follow verbal and written directions						
* + LA	Apply reading and writing skills						
* +	Use effective leadership skills						
* + LA	Solve problems						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
* LA	Identify proper termination procedures						
	AUTO MAINTENANCE						
SS	Understand automotive history						
S	Identify internal combustion engine terms, principles, and technology						
S	Work safely						
S	Understand the value of systematic diagnosis						
S	Maintain automotive cooling systems						
S	Maintain automotive fuel systems						
S	Maintain automotive electrical systems						
S	Maintain automotive lubrication systems						
S	Maintain automotive pollution control systems						
S	Maintain automotive braking systems						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Maintain automotive steering systems						
S	Maintain automotive suspension systems						
S	Maintain automotive chassis systems						
S	Maintain automotive transmission systems						
S	Maintain automotive heating and air conditioning systems						
S	Maintain automotive hydraulic systems						
S	Perform routine maintenance and tuneups						
S	Winterize automotive systems						
S	(A) Map automotive systems						
S	(A) Apply automotive maintenance skills						
	BUILDING MAINTENANCE						
S	Maintain building floors						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Use and maintain cleaning equipment						
S	Clean walls and windows						
S	Clean carpet						
S	Maintain light fixtures						
S	Fix basic electrical problems						
S	Repair and paint damaged walls						
S	Clean and polish surfaces						
S	Maintain basic plumbing						
S	Service heating and other building support equipment						
S SS	Secure building and property						
S LA	Safely store materials and chemicals						
S	Perform outdoor building maintenance						

Recommended Competencies by Course Offerings Competencies		Industrial EducationI	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Care for lawn and shrubbery						
S	Dispose of trash						
S	Maintain rest rooms						
	COMMERCIAL FISHING						
S SS	Identify the harvesting and processing of marine products						
S SS	Correctly handle, process and market marine products						
S M LA	Use good boating safety and seamanship						
S M LA	(A) Get a vessel underway						
S M LA	(A) Maneuver a vessel						
S M LA	(A) Conduct deckhand duties						
S M LA	(A) Anchor a vessel						
S M LA	(A) Dock a vessel						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
SM	(A) Conduct line fishing duties						
SM	(A) Perform pot and trawl fisher duties						
SM	(A) Conduct net fishing duties						
SM	(A) Maintain vessels						
SM	(A) Prepare meals aboard the vessel						
SMLA	(A) Perform vessel emergency procedures						
SM	(A) Maintain and operate fish processing and preservation equipment						
SM	(A) Maintain fish quality						
	COMMUNICATIONS						
SMSSLA	Identify the principles of light and sound transmission						
SMSS	Understand how the telephone works						
SMSS	Understand how the radio works						

Recommended Competencies by Course Offerings Competencies		Industrial EducationI	Industrial EducationI	Advanced Principles of Technology I	Advanced Principles of Technology II		
S M SS	Understand how a television functions						
S M SS	Identify recent innovations in home communications						
S M SS	Identify uses of citizens band and amateur radios						
S M SS	Identify computer communications methods and systems						
S SS LA	Analyze the effects of telecommunications on society						
	CONSTRUCTION						
S SS	Work safely						
S M	Use common construction tools and materials						
S M	Perform construction calculations						
S M SS	Identify site selection considerations						
S M LA	Read blueprints						
S M SS	Select and install insulation and vapor barriers						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S M SS	Identify alternative and energy-efficient home heating systems						
SS	Identify construction trade career opportunities						
	DRAFTING						
S	Follow drafting safety procedures						
S LA	Care and store drafting equipment properly						
S M	Use drafting tools						
LA	Letter and label title blocks correctly						
M	Measure and scale drawings						
S M	Complete standard orthographic drawings						
S M	Produce drawings						
S M	Draw architectural plans for a small house						
SS	Identify occupations which require drafting skills						

Recommended Competencies by Course Offerings Competencies		Industrial EducationI	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S M	(A) Complete drafting plans for a metal or woodworking project						
S M SS	(A) Use a CAD (Computer-Aided Drafting) system						
	ELECTRONICS						
S M	Apply principles of electronics						
S M	Set up a circuit						
S M	Use electronic test equipment						
S M	Service electronic devices						
SS	Identify careers in electronics						
S M	(A) Replace basic electronic components						
S M	(A) Clean electronic devices						
	ENERGY AND POWER						
S	Apply principles of energy and power						

Recommended Competencies by Course Offerings

Competencies

		Industrial Education	Industrial Education	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Identify characteristics of available energy						
S	Apply principles of friction						
S SS	Identify energy sources						
S SS	Identify energy issues relevant for Alaska						
S SS	Identify problems inherent in various energy systems						
M	Use English or American units of measurement						
M	Use metric measurements						
S M SS	Measure energy						
S M SS	Understand energy utilization						
S	Apply principles of mechanical power						
S	Understand mechanical advantages						
S M	Apply principles of simple machines						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Apply torque principles						
S	Identify mechanical energy systems						
S M	Apply principles of gears and pulleys						
S	Identify belts and chains system						
S	Apply principles of fluid hydraulics						
S	Apply principles of electricity						
S	Identify electrical power generation methods						
S	Understand electrical circuits						
S	Identify basic electrical devices						
S SS	Identify advanced uses of electricity						
S SS	Identify environmental impacts of energy extraction and utilization						
S SS	Identify experimental and alternative energy systems						

Recommended Competencies by Course Offerings

	Competencies	Industrial Education I	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Apply principles of light energy						
S SS	Identify uses of solar energy						
S SS	Identify heat energy principles						
S	Identify principles of heat conversion and transfer						
S	Identify the principles of steam energy for power generation						
S	Identify principles of sound						
S	Identify principles of radiation energy						
S	Identify principles of gravitational energy						
S	Identify principles of nuclear energy						
S SS	Identify nuclear energy considerations						
S	Identify how nuclear reactors work						
S	Identify principles of energy conversion						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Identify principles of energy transmission						
S	Identify principles of energy storage						
S	Identify principles of chemical energy						
S	Use energy and power safely						
S	(A) Identify advanced applications of electro-mechanical technology						
S	(A) Apply principles of pneumatics						
	FORESTRY AND LOGGING						
S SS	Identify the role of forestry products in modern society						
S	Use forestry tools						
S	Work safely						
S SS	Identify the role of fires in modern forestry						
S M	Complete a rough land survey						

Recommended Competencies by Course Offerings

Competencies

		Industrial Educationl	Industrial Educationl	Advanced Principles of Technology I	Advanced Principles of Technology II		
S SS	Identify major commercial hardwood and softwood species						
S M	Cruise and scale timber						
S SS	Identify timber harvesting techniques						
S	Plant trees						
S SS	Identify raw materials used in forest product manufacturing						
S	Use a chain saw						
SS	Identify forestry employment opportunities						
	GRAPHICS						
SS	Understand history of graphic communications						
S LA	Identify the principles of graphics						
S LA	Identify the elements of design						
S LA	Identify typestyles and graphics						

Recommended Competencies by Course Offerings

Competencies

	Competencies	Industrial Education I	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S M LA	Layout a project						
S	Identify printing supplies						
S	Identify different printing processes						
S	Identify graphic production techniques						
S	Store and duplicate graphics						
S	Work safely						
S	Identify the parts of a camera						
S	Identify types of cameras						
S	Identify types and functions of films						
S LA	Use a camera						
S M	Develop film and prints						
SS	Identify careers in graphics						

	Recommended Competencies by Course Offerings Competencies	Industrial EducationI	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
S SS	(A) Identify terms and concepts integral to graphic communications						
S	(A) Use a computer for graphic illustrations						
S LA	(A) Typeset copy						
	HIGH TECHNOLOGY						
S SS	Understand computer technology						
S SS	Understand robotic technology						
S	Understand Computer-Aided Drafting (CAD)						
S SS	Understand Computer-Aided Manufacturing (CAM)						
S SS	Understand satellite technology						
S	Use laser technology						
S	Use photovoltaic technology						
SS	Identify jobs in high technology						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
	HORTICULTURE						
S	Identify local climactic conditions requiring special gardening procedures						
S SS	Identify the potential for subsistence and comme' ial agriculture						
S	Plant a garden						
S M	Plan and design a greenhouse						
S	Control greenhouse humidity						
S	(A) Prepare a rich soil bed						
S	(A) Control air movement and temperature in the greenhouse						
S	(A) Select crops for the greenhouse						
S	(A) Control pests and diseases in the greenhouse						
	MANUFACTURING						
SS	Identify major concepts of manufacturing						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S SS	Identify resources used in manufacturing						
SS	Identify major steps in the manufacturing process						
SS	Identify company organization strategies						
SS	Identify the role of management in a manufacturing enterprise						
S SS	Identify the function of research and development in manufacturing						
M	Calculate manufacturing problems						
M S	Assemble bench work						
M S	Perform bench work						
S	Maintain precision machine parts						
M S	Operate a drill press						
SS	(A) Organize a manufacturing company						
M SS	(A) Design a mass production project						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
M S SS	(A) Plan and enter production						
	METALS						
S	Identify characteristics of commonly-worked metals						
M S	Construct projects using shop drawings						
M S	Apply metalworking techniques						
M S	Use appropriate welding technique						
M	Calculate material costs						
S	Use common fastening devices						
M	Measure and calculate accurately						
S	Arc weld						
S	Use oxy-acetylene welding equipment						
S	Heat, form, and bend metal						

Recommended Competencies by Course Offerings Competencies		Industrial EducationI	Industrial EducationII	Advanced Principles of Technology I	Advanced Principles of Technology II		
SS	Identify jobs in metalworking and welding						
	MINING AND PETROLEUM						
S	Identify geological theories						
S	Identify mineral location and extraction techniques						
S SS	Identify mining issues						
SS	Identify jobs in the mining industry						
SS	Identify the history of oil exploration						
S	Identify the importance of oil to Alaska's economy						
S	Identify petroleum drilling and production techniques						
SS	Identify petroleum transportation methods						
S	Identify petrochemical refining and manufacturing processes						
S SS	Identify petroleum products and their uses						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
SS	Identify methods of marketing oil products						
S SS	Identify the importance of alternative fuel development						
S SS	Identify environmental impacts of energy extraction						
SS	Identify jobs in the oil industry						
	SMALL ENGINE MAINTENANCE						
S	Work safely						
S	Maintain electrical and ignition systems of small engines						
S	Maintain fuel systems common to small engines						
S	Maintain lubrication systems used in two- and four-cycles small engines						
M S LA	Use engine manuals and parts lists						
S	Use small engine fasteners						
S	Use appropriate gaskets and seals						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Understand two- and four-cycle engines						
S	Understand diesel engine operation and repair						
S	Install small engines						
S	Maintain and repair small marine engines						
S	Troubleshoot small engines systematically						
SS	Describe career opportunities in small engine repair						
	TECHNOLOGICAL IMPACTS						
SS	Identify technological impacts of highways						
SS	Identify technological impacts of communications						
SS	Identify social concerns relative to production						
SS	Identify conservation concerns						
SS	Identify social concerns relative to inventions						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S SS	Identify effects of air pollution						
S SS	Identify acid rain concerns						
S SS	Identify effects of thermal pollution on lakes and streams						
S SS	Identify impacts of power generation						
S SS	Identify ways to conserve natural resources						
S SS	Identify ways to conserve energy						
S SS	Identify ways to control hazardous wastes						
	TRANSPORTATION						
SS	Understand the importance of marine shipping to Alaska						
SS	Understand the importance of land shipping to Alaska						
SS	Identify ways of transporting hazardous materials						
SS	Apply aerodynamic principles						

Recommended Competencies by Course Offerings Competencies		Industrial Education	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
SS	Understand the importance of air transportation in Alaska						
SS	Identify alternative methods of transportation						
SS	Identify characteristics of shipping jobs						
SS	Identify jobs related to highway transportation in Alaska						
SS	Identify jobs related to air travel						
SS	Identify jobs in tourism						
	WIRING AND PLUMBING						
S	Work safely						
S	Use hand and power tools safely						
MS	Wire safely						
MS	Apply plumbing principles						
M	Make proper plumbing measurements						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
S	Repair home plumbing						
S	Install copper pipe						
S	Install plastic pipe						
S	Support and hang pipe						
S	Replace fixtures						
SS	Identify jobs in plumbing and wiring						
	WOODWORKING						
S	Work safely						
M S	Identify woodworking principles						
S	Use and maintain hand tools						
S	Use and maintain power tools						
M S	Complete a basic woodworking project						

Recommended Competencies by Course Offerings Competencies		Industrial Education I	Industrial Education II	Advanced Principles of Technology I	Advanced Principles of Technology II		
SS	Identify woodworking career opportunities						
MS	(A) Complete an advanced woodworking project						
	ADVANCED PRINCIPLES OF TECHNOLOGY						
MS	Apply the principles of force as related to different systems						
MS	Identify the principles of work as related to different systems						
MS	Relate principles of "rate" to different systems						
MS	Apply principles of resistance in different scientific systems						
MS	Apply principles of energy used in different technological systems						
MS	Apply the principles of power as related to different systems						
MS	Apply the principles of power as related to different systems						
MS	Apply the principles of force transformers in different systems						

VI
Sample Skills Card

Sample Skills Card

This section of the guide provides teachers with an example format of an instrument for evaluating the effectiveness of instruction. The skills record allows teachers to assess competency at four levels of proficiency. Teachers are encouraged to construct their own skills performance record using the competency lists in the curriculum section of this guide.

Instructions for Use

The list of vocational skills/traits was developed from a task analysis of an industrial education competency.

LEVEL CODE KEY:

1 Introductory Level: Can do simple parts of task. Needs to be told/shown how to do most of the task. Needs extremely close supervision.

2 Minimum Level: Can do most parts of the task. Needs help only with most difficult parts. Needs close supervision.

3 Average Level: Can do all parts of task. Needs only spot-check of completed work. Meets local demands for speed and accuracy. Needs moderate job entry supervision.

4 Proficiency Level: Can complete task quickly and accurately. Can direct others in how to do the task. Needs little supervision.

DIRECTIONS: The instructor/employer may write, date and initial in appropriate square.

Service electronic devices

1	2	3	4	
				- Practice electronic soldering techniques
				- Construct a PC board
				- Locate component malfunctions
				- Mount system in/on physical support
				- Record meter readings
				- Splice wires
				- Solder/unsolder components
				- Perform quality control checks

COMMENTS:

VII
Suggested Resources

Suggested Resources

This section identifies specific resources and sources for finding instructional materials and supplies for industrial education.

The following source lists have been characterized by media type to facilitate teacher use: resource libraries, publishers of texts and instructional materials, state resources, associations, periodicals, special books and pamphlets, multi-media and materials suppliers.

The Alaska Department of Education has not formally reviewed nor approved all the resources listed in this section. Teachers are encouraged to preview materials before using them in the classroom.

Resource Libraries

Alaska Vocational Materials Library
Office of Adult & Vocational Education
Alaska State Department of Education
Box F
Juneau, AK 99811
(907) 465-2980

- Alaska Energy Education Series
- Appropriate Technology for Alaskans
- Basic Skills For The Trades
- Building in the North
- Choices & Challenges: A Young Man's and Teen Woman's Journal for Self-Awareness and Personal Planning
- Cooperative Education and On-The-Job Training Handbook
- Energy Conservation in Construction Trades
- Go For It! Women Working in Construction-Related Trades in Alaska
- Home Energy Conservation Techniques (Videos)
- Introduction to Marine Technology
- Local Advisory Committee: Handbook for Vocational Administrators
- Pre-Employment Competencies Resource Guide
- Sled Construction
- The How Book on Dog Sled Construction & Equipment
- Uluaq Construction
- Alaska's Seas and Coasts
- Commercial Fishing Methods
- Mechanization of Small Fishing Craft
- Mending of Fishing Nets
- Safety and School Shop Planning
- STARS: Secondary Training For Alaska

The Library maintains curricula for all vocational areas. Resources are loaned for a 2 month review period. There are also many materials which may be purchased from the Library's special collections. Some materials are available free of charge.

The Library's catalog is computerized and may be operated on an Apple Computer using Appleworks Software. The catalog may be obtained by sending $10.00 (please make your check payable to the South East Regional Resource Center) or by sending five blank disks for duplication.

Alaska Career Information System
Office of Adult and Vocational Education
Alaska Department of Education
Box F
Juneau, AK 99811
(907) 465- 2980

- Comprehensive career guidance system developed by Alaskans and for Alaskans seeking occupational and educational opportunities in and out of Alaska.

Alaska Health Sciences Library
3211 Providence Drive
Anchorage, AK
(907) 786-1870

- Journals and magazines in the area of job safety and health

Northwestern Vocational Curriculum Coordination Center
St. Martin's College
Lacey, WA 98503

- 10-State regional library of vocational materials. Can be accessed through the Alaska Vocational Materials Library.

National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, OH 43210

- Vocational Education Curriculum Materials database of all 50 states. Can be accessed through the Alaska Vocational Materials Library.
- Catalog of materials available on new technology in vocational-technical education.

Publishers

American Technical Publishers, Inc.
12235 South Laramie Ave.
Alsip, IL 60658

Bennett & McKnight
A Division of Glencoe Publishing Co.
17337 Ventura Blvd.
Encino, CA 91316

Dancraft
Daniel International Corporation
301 North Main Street
Greenville, SC 29601

Delmar Publishers, Inc.
2 Computer Drive West
Albany, NY 12212

Goodheart-Wilcox, Inc.
123 W. Taft Drive
South Holland, IL 60473

Hobart School of Welding Technology
Trade Square East
Troy, OH 48373

Industrial Press, Inc.
200 Madison Avenue
New York, NY 10016

Ken-Cook Educational Systems Worldwide
12855 W. Silver Spring Drive
P.O. Box 207
Butler, WI 53007

McGraw-Hill Book Co./Gregg Division
Western Regional Office
8171 Redwood Highway
Novato, CA 94947

National Textbook Company
4255 W. Touhy Avenue
Lincolnwood, IL 60646

Prakken Publications, Inc.
P.O. Box 8623
Ann Arbor, MI 48107

South Western Publishing Co.
5101 Madison Road
Cincinnati, OH 45227

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Technical Training Aids
P.O. Box 20042
Birmingham, AL 35216

Intertec Publishing Corporation
Technical Publications
P.O. Box 12901
Overland Park, KS 66212

Trade Press Publishing Company
407 E. Michigan Street
Milwaukee, WI 53201

State Resources

Alaska Department of Environmental Conservation
P.O. Box 0
Juneau, AK 99811

- Provides information on the handling, transportation and disposal of hazardous waste materials.

Alaska Department of Labor
Occupational Safety and Health Section
3301 Eagle Street
P.O. Box 7-022
Anchorage, AK 99501

- Provides free information, training and inspections.

Alaska Department of Natural Resources
Division of Mining
555 Cordova Street, Olympic Bldg.
Box 7-016
Anchorage, AK 99510

- Manages mining industry in Alaska.

Curriculum Publications Clearinghouse
Western Illinois University
Horrabin Hall Y6
Macomb, IL 61455

- Competency-Based Pre-Service Construction Trades Curriculum
- Industrial Technology Curriculum Guides (Communication, Energy Utilization, Production & Transportation)
- Machine Shop Fundamentals
- Microcomputer Applications in Vocational Education: Trades & Industry
- Vocational-Technical Education Consortium of States (V-TECS). Catalogs of performance objectives & curriculum guides for technical trade & industrial education occupations

Curriculum and Instructional Materials Center (CIMC)
Oklahoma State Department of Vocational & Technical Education
1500 West Seventh Avenue
Stillwater, OK 74074

- Auto Body
- Auto Mechanics I & II
- General Construction Trades
- Highway Maintenance Equipment Operator
- Industrial Electricity and Electronics
- Machine Shop
- Millwright

Curriculum Development Unit Office of Vocational Education 2024 Capital Plaza Tower Frankfort, KY 40601	. Competency-Based Materials for Industrial Education
East Central Curriculum Management Center Illinois Office of Education 100 North 1st Street E. A-26 Springfield, IL 62777	. Performance Analysis for Building Maintenance Occupations
Instructional Materials Laboratory 10 Industrial Education Bldg. University of Missouri-Columbia Columbia, MO 65211	. Instructional Materials for Industrial Education
Michigan Vocational Education Resource Center 133 Erickson Hall Michigan State University East Lansing, MI 48824	. Trades & Industry Resource Materials
Mid-America Vocational Curriculum Consortium (MAVCC) 1500 West Seventh Ave. Stillwater, OK 74074	. Air Conditioning & Refrigeration Series . Basic Drafting Book I & II . Basic Electronics Book I & II . Chain Saw Repair . Diesel Mechanics Series . Graphic Arts Books I,II & III . Introduction to Welding . Outdoor Power Equipment Repair . Residential Solar Systems . Sheet Metal Series . Small Engine Repair . Snowmobile Repair
Minnesota Curriculum Services Center 3554 White Bear Avenue White Bear Lake, MN 55110	. Heating and Air Conditioning . Machine Shop Operations . Mechanical Trades (Residential) and Welding Occupations Terminal Performance Objectives
Occupational Curriculum Laboratory East Texas State University Mayo Hall, Room 213 Commerce, TX 75428	. Building Maintenance . General Construction Trades I,II . General Mechanical Repair . General Metal Trades I-IV . Small Engine Repair

Ohio Instructional Materials Laboratory The Ohio State University 154 W. 12th Ave. Room 139 Columbus, OH 43210	. Custodial Training Learner's Manual . Machine Trades I,II, III . Shop Safety
Oregon Career Development Consortium Marion Education Service District 651 High Street NE Suite 4 Salem, OR 97301	. Basic Skills in Vocational Education: Computer Skills, Mathematics, Reading, Speaking/ Listening, and Writing
Portland State University Division of Continuing Education P.O. Box 1491 Portland, OR 97207	. Individualized Learning Systems for Auto Body and Fender, Auto Mechanics, Construction, Drafting, Electrical, Electronics, Hydraulics, Industrial Mechanics, Metals, and Welding
University of Alaska, Fairbanks Alaska Sea Grant College Program Attorney's Plaza Suite 1A Fairbanks, AK 99775	. Alaska Sea/River Week Curriculum Guides
University of Alaska, Fairbanks School of Mineral Engineering Brooks Building Room 209 Fairbanks, AK 99701	. Provides reports and information on mining and offers assistance to miners.
University of Alaska, Fairbanks Mineral Industry Research Laboratory 210 O'Neil Resources Building Fairbanks, AK 99701	. Conducts studies and research on development and use of Alaska's minerals and coal resources.
University of Texas at Austin P.O. Box 7218 Austin, TX 78713	. Bricklayer and Stonemason . Building Maintenance Repairer . Cabinetmaker . Carpentry I & II . Construction Technology . Woodworking Technology
Utah State Office for Vocational Education 250 East 500 South Salt Lake City, UT 84111	. Computer-Aided Manufacturing . Computer, Laser, Photovoltaic, Robotic, and Satellite Technology curriculum guides
Vocational Studies Center University of Wisconsin - Madison 964 Educational Sciences Bldg. 1025 West Johnson Street Madison, WI 53706	. Tools, Equipment & Machinery: Adapted for Vocational Education and the Employment of Handicapped People . Urban Soil and Water Management

Associations

Alaska Loggers Association
111 Steadman Suite 200
Ketchikan, AK 99901

- Information on forestry and timber industry.

Alaska Miners Association, Inc.
Statewide Office
509 West 3rd Avenue Suite 17
Anchorage, AK 99501

- Information on mining in Alaska.

Alaska Oil and Gas Association
505 W. Northern Lights Blvd Suite 219
Anchorage, AK 99503

- Alaska Oil and Gas Industry Facts
- The Alaska Oil and Gas Story

American Association for Vocational Instructional Materials (AAVIM)
120 Driftmeir Engineering Center
Athens, GA 30602

- Arc Welding
- Assisting Students in Improving their Basic Skills
- ATV Maintenance Manual
- Building Materials Costs (Computer Software)
- Concrete and Concrete Masonry
- Construction: Basic Principles
- Developing Shop Safety
- Drywall
- Electric Motors
- Electrical Wiring
- How to Paint Your House
- Inboard/Outboard Service Manual
- Maintaining the Lighting & Wiring System
- Masonry Simplified
- Measurement & Layout Tools (Computer Software)
- Metals & Welding
- Plumbing Installation and Design
- Power Tool Safety Operation
- Rafter Layout in the Framing Square for School and Home Workshop
- Shop Planning
- Small Engines I & II
- Snowmobile Service Manual
- Understanding & Measuring Power
- Understanding Electricity & Electrical Terms
- Welding Skills

American Petroleum Institute 1220 L Street NW Washington, D.C. 20005	. Black Gold on the Kenai . Facts About Oil . Fish and Offshore Oil Development . Oil and Gas and the Challenge of the Arctic . Petroleum Exploration: Continuing Need
American Technical Society 12235 So. Laramie Ave. Alsip, IL 60658	. Machine Shop Operations and Set Ups
American Vocational Association (AVA) 1410 King Street Alexandria, VA 22314	. Instructional Materials for Electronics, Technical Communications, Mechanical & Laser/ElectroOptics Techologies, AC/Heating & Auto Repair.
Artists and Blacksmiths Association of North America P.O. Box 303 Cedarburg, WI 53012	. The Anvil's Ring
Associated Builders & Contractors 729 15th Street N.W. Washington, DC 20005	. Wheels of Learning Instructional Materials
Associated General Contractors of America 1957 E. Street N.W. Washington, DC 20006	. Bricklaying . Commercial & Residential . Carpentry Series . Cement Masonry . Construction Craftsman . Manual of Accident Prevention in Construction . Millwright . Heavy Equipment Mechanic Series . Heavy Equipment Operator Series
Instrument Society of America 67 Alexander Drive P.O. Box 12277 Research Triangle Park, NC 27709	. Publications & Training Aids Catalog
International Association of Plumbing & Mechanical Officials IAPMO Hdqs 5032 Alhambra Avenue Los Angeles, CA 90032	. Uniform Plumbing Code

National Forest Products Association
1250 Connecticut Avenue NW
Washington, D.C. 20036

- Information on colleges and universities offering forestry degrees.
- Opportunities Unlimited in Forestry

National Institute for Occupational Safety and Health
Regional Office
321 Second Avenue
Mail Stop 502
Seattle, WA

- Provides technical information, assistance and publications on job safety and health.

Occupational Safety and Health Administration
U.S. Federal Court Bldg Room C543
701 C Street
Box 29
Anchorage, AK 99503

- Concepts and Techniques of Machine Safeguarding

Society of Manufacturing Engineers
One SME Drive
P.O. Box 930
Dearborn, MI 48121

- High Technology Materials

United Brotherhood of Carpenters and Joiners
101 Constitution Avenue NW

- Carpentry Apprentice Training Course
- Carpenter Magazine

Vocational Industrial Clubs of America (VICA)
P.O. Box 3000
Leesburg, VA 22075

- Advisor Guide/Integrating VICA into the Trades & Industrial Program
- National Leadership Handbook

Periodicals

American Industrial Arts Association
1914 Association Drive
Reston, VA 22091

- The Technology Teacher

Associated General Contractors of America
1957 E. Street N.W.
Washington, DC 20006

- Constructor Magazine

Cummins Publishing Company
31600 Telegraph Road, Suite 200
Birmingham, MI 48010

- Industrial Education

Energy Publications, Inc.
P.O. Box 2008
Laconia, NH 03247

- WoodHeat

John A. Linkletter
Hearst Corp.
224 W. 57th Street
New York, NY 10019

- Popular Mechanics

Martin Fox R.C. Publications, Inc.
355 Lexington Ave.
New York, NY 10017

- Print

National Association of Home Builders
15th and M Streets NW
Washington, DC 20005

- The NAHB Journal of Home Building

Prakken Publications
P.O. Box 8623
Ann Arbor, MI 48107

- School Shop

Solar Vision Inc.
P.O. Box 8420
Philadelphia, PA 19101

- Progressive Builder: Energy Efficiency and Quality Home Construction

Taunton Press, Inc.
P.O. Box 355
Newton, CT 06470

- Fine Homebuilding
- Fine Woodworking

Vernon Publications, Inc.
109 W. Mercer Street
Seattle, WA 98119

- Alaska Construction and Oil

Village Press, Inc.
P.O. Box 1810
Traverse City, MI 48107

- The Home Shop Machinist

Workbench Magazine
4251 Pennsylvania Avenue
Kansas City, MO 64111

- Workbench Magazine

Special Books/Pamphlets

Alaska Health Project
417 West Eighth Ave.
Anchorage, AK 99501

- Alaskan Health Hazards in the Workplace: It's Your Right to Know
- Keep This In Your Tool Box: A Health & Safety Manual for Alaska Construction Workers

Alaska Seafood Marketing Institute
526 Main Street
Juneau, AK 99801
(907) 586-2902

- Challenge for Excellence (video)
- Competitive Edge (video)
- Fresh and Frozen Salmon: How to Sell It (video)
- Handle With Care: A Retail Seafood Quality Primer
- Handle With Care: Recommended Seafood Quality Guidelines for Reprocessors and Cold Storages of Alaska Seafood
- Handle With Care: The Alaska Shipper's Guide to Seafood Quality
- Handling Fish: A Handbook for Commercial Fisheries Biologists
- Recommended Salmon Quality Guidelines for Fishing, Tendering and Processing Operations
- Recommended Whitefish Quality Guidelines for Fishing and Processing Operations
- The Seafood Quality Primer: Consumer Tips for Purchasing, Handling and Storing High Quality Seafood

Alyeska Pipeline Service Company
1835 South Bragaw Street
Anchorage, AK 99512

- Operating the Trans-Alaska Pipeline

Arctic Environmental Information and Center
707 A Street
Anchorage, AK 99501

- Provides information and data on Alaska and circumpolar arctic environments and natural resources.

Atlantic Richfield Company
515 S. Flower Street
Los Angeles, CA 90051

- Welcome to the North Slope

Cooperative Extension Service
Statewide Office
University of Alaska
303 Tanana Drive
Fairbanks, AK 99701

- Agricultural Land Development Practices
- Alaska Dwelling Construction Guide
- Fisheries Safety & Survival Series
- Home Heating Systems/Fuels/ Controls
- Housing & Energy Construction Materials
- Painting Inside & Out
- Pollution: What Extension Can Do About It
- Power Chain Saws - Their Care & Use
- Safety Notes For The North Pacific Fisherman
- Simple Plumbing Repairs For The Home
- Snowmobiling Safety
- Soil Sampling
- Special Considerations for Building in Alaska
- Wood Finishing Series

Creative Home Owner Press
A Division of Federal Marketing Corporation
24 Park Way
Upper Saddle Riv -, NJ 07458

- Heating, Cooling and Ventilation
- Plumbing for Old and New Homes

Hearst Marine Books
105 Madison Avenue
New York, NY 10016

- Chapman Piloting: Seamanship and Small Boat Handling

Kotzebue Technical Center
P.O. Box 51
Kotzebue, AK 99752

- Curriculum Guide: Overview of Building Maintenance

Omni Press Publications
International, Ltd.
Doubleday and Company, Inc.
Anchor Books
245 Park Avenue
New York, NY 10017

- Robotics

Ortho Books
Chevron Chemical Company
575 Market Street
San Francisco, CA 94105

- Basic & Finish Carpentry Techniques
- Basic Masonry Techniques
- Basic Plumbing Techniques
- Basic Remodeling Techniques
- Basic Wiring Techniques
- Energy Saving Projects for the Home
- How To Build and Use Greenhouses
- Ortho's Home Improvement Encyclopedia: Problem Solving from A to Z

Reader's Digest Association, Inc.
Pleasantville, NY

- Home Improvements Manual
- Reader's Digest Complete Do-It-Yourself Manual

Rodale Press, Inc.
Emmaus, PA 18049

- Low-Cost, Energy Efficient Shelter for the Owner & Builder
- Movable Insulation

R.S. Means Company, Inc.
Construction Consultants and Publishers
100 Construction Plaza
P.O. Box 800
Kingston, MA 02364

- Means Illustrated Construction Dictionary

SOHIO
A Company of Standard Oil
101 Prospect Avenue
Cleveland, OH 44115

- Prudhoe Bay and Beyond

Sunset Books
Lane Publishing Company
Menlo Park, CA 94025

- Basic Carpentry
- Basic Home Repairs
- Basic Home Wiring
- Basic Masonry
- Do-It-Yourself Energy Savings Projects
- Insulation and Weatherstripping
- Solar Heating & Cooling

Ten Speed Press
PO Box 7123
Berkeley, CA 94704

- Before You Build: A Pre-Construction Guide
- The Complete Wood-Worker

U.S. Forest Service
Alaska Region
Federal Office Building
P.O. Box 1628
Juneau, AK 99802

- Alaska Commercial Tree Species
- Alaska: Minerals to Match the Mountains
- Alaska Solitude: Wilderness Areas of the Tongass National Forest
- Enhancing A Great Resource: Anadromous Fish Habitat
- Investigating Your Environment: Teaching Materials for Environmental Education
- Land at River's End: The Copper River Delta
- New Industries in Alaska's National Forests: Planting, Thinning, Release and Weeding
- Recreational Mining: Chugach National Forest
- Reference Guide for Environmental Education and Conservation of Natural Resources
- Timber Management
- Wildlife Perspective: The Next 100 Years of Forestry in Alaska
- Woodsy Owl Environmental Education Teacher's Kit

U.S. Geological Survey
Public Inquiries Office
4230 University Drive Room 101
Anchorage, AK 99508

- Information and publications on physical resources of Alaska.

Multi-Media Materials

Autodesk, Inc.
2320 Marinship Way
Sausalito, CA 94965

Career Aids, Inc.
20417 Nordhoff Street, Dept SW8
Chatsworth, CA 91311

Dana Corporation
School Assistance
Box 453
Toledo, OH 43692

DCA Educational Products, Inc.
4685 Stenton Ave
Philadelphia, PA 19144

Edu-Tech Publications Division
Commercial Service Co.
Box 2499
Anderson, IN 46011

EMC Publishing Co.
Changing Times Education Service
300 York Ave.
Saint Paul, MN 55101

Hobar Publications
1234 Tiller Lane
St. Paul, MN 55112

Masonry Specialty Company
4430 Gibsonia Road, RT 910
Gibsonia, PA 15044

Meridian Educational Corp.
Library Filmstrip Center
205 E. Locust Street
Bloomington, IL 61701

National Archives & Records
Administration
National Audiovisual Center
8700 Edgeworth Drive
Capitol Heights, MD 20743

National Innovative Media Co.
Route #2, Box 301 B
Calhoun, KY 42327

Pictures, Inc.
811 W. 8th Ave.
Anchorage, AK 99501

Sargent Welch Scientific Company
7300 North Linder Avenue
Skokie, IL 60077

Teaching Aids, Inc.
P.O. Box 1798
Costa Mesa, CA 92626

The Media Center
State Fair Community College
1900 Clarendon Road
Sedalia, MO 65301

Vocational Media Associates
Prentice-Hall Media
P.O. Box 1050
Mount Kisco, NY 10549

VTR-Industrial Training
Video Training Resources, Inc.
7500 West 78 Street
Edina, MN 55435

Materials Suppliers

Advance Process Supply Co.
400 N. Noble Street
Chicago, IL 60622

Allied Electronics
401 E. 8th Street
Fort Worth, TX [illegible]

Broadhead-Garrett Co.
Western Division
161 Commerce Circle
P.O. Box 15528
Sacramento, CA 95852

Buckner-Weatherby Company, Inc.
5931 Fourth Ave. South
Seattle, WA 98108

Delvies Plastics, Inc.
P.O. Box 1415
Salt Lake City, UT 84110

Enco Manufacturing Co.
5000 W. Bloomingdale
Chicago, IL 60639

Industrial Arts Supply Co.
5724 West 36th Street
St. Louis Park, MN 55416

John Deere and Company
Distribution Service Center, Dept 150
1400 3rd Avenue
Moline, IL 61265

Midwest Shop Supplies, Inc.
2600 Bridgeport
P.O. Box 3717
Sioux City, IA 51102

Modern School Supplies, Inc.
P.O. Box 958
Hartford, CT 06143

Northern Hydraulics, Inc
P.O Box 1499
Burnsville, MN 55337

SATCO, Division of Saterlee
924 South 19th Ave.
Minneapolis, MN 55404

Sears, Roebuck & Co.
Sears Tower
Chicago, IL 60684

Snap-On-Tools Corp.
2801 80th Street
Kenosha, WI 53204

T & W Systems
7372 Prince Drive
Huntington Beach, CA 92647