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ABSTRACT

This curriculum guide contains learning module outlines for teaching a series of courses in pipefitting in high schools in Alberta. Each module provides selected learning experiences to develop basic competence in plumbing, pipefitting, and related trades. Each module consists of an introduction, objectives, learning resources list, content summary, and a number of topics, each with a generalization and concepts/subconcepts related to learning tasks. The modules cover the following topics: a general introductory course, domestic plumbing, domestic heating, commercial and industrial plumbing, drawing and estimating, (advanced) commercial and industrial plumbing, and special topics in piping, on three levels. An introductory section explains the industrial education program and the piping courses in Alberta. (KC)

ACKNOWLEDGEMENTS

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PIPING

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|---|---|---|
| Gerry Smith | - | Victoria Composite High School, Edmonton. |
| Manfred Weckessor | - | Victoria Composite High School, Edmonton. |
| J.D. Harder | - | Alberta Education, Edmonton. |
| J. Pallas | - | Alberta Education, Edmonton. |
| A. McCaughan | - | Alberta Education, Edmonton. |

NOTE: This Curriculum Guide is a service publication only. The Senior High School Program of Studies contains the official statement concerning Senior High School courses. The information contained in the guide is prescriptive insofar as it duplicates that contained in the Program of Studies. There are in the Guide, however, as well as content, methods of developing the concepts, suggestions for the use of teaching aids and lists of additional reference books.

# TABLE OF CONTENTS

# INDUSTRIAL EDUCATION

## RATIONALE

Industrial Education is a program consisting of courses which provide a continuum of experiences, starting with exploratory activities in the junior high school and expanding in the high school to the development of skills related to career fields. This development of the student's skills is planned for through courses in industrial and vocational education culminating in on-the-job work experience, or entry into a job or post-high school institution for further education.

The program consists of courses ranging from those designed for an exploration of the technologies and trade areas to units of practical preparation for a career. In the process the courses develop the student's self-knowledge, talents and skills.

For information on sequencing and course description, refer to the "Industrial Education Manual for Guidance to Teachers, Counsellors and Administrators".

## PROGRAMS

There are two parts to the Industrial Education program. The first part consists of the I.E. 10, 20, 30 series of courses and is designed for career orientation. These courses were developed primarily for students in laboratories that utilize the multiple activity approach as found in most smaller schools, but they can be taught in unit shops as well.

The second part consists of the I.E. 12, 22, 32 series of courses and is intended for career development. The courses are planned for use in schools where facilities are available to teach specific occupational areas.

Students may progress from the I.E. 10, 20, 30 series to the 22 level courses upon meeting specified basic prerequisites or upon recommendation of their principal.

Both sections of the program focus on six career fields. These are:

Graphic Communications
Mechanics
Construction and Fabrication
Electricity-Electronics
Personal Services
Horticulture

The I.E. 10, 20, 30 courses consist of a number of one credit modules related to the career fields while the I.E. 12, 22, 32 courses consist of a number of five credit modules of specific occupational content. Completion of seven five credit modules qualifies the student for recognition by the Apprenticeship Branch for credit towards a journeyman's certificate.

It is left to the administrators of the school to offer the courses or combination of courses best suited to the needs and interests of the students and the financial resources of the district.

Courses offered at the 22 and 32 level have to meet special criteria for staff and facilities. The Industrial Education Consultant must authorize these in order to qualify the students for vocational grants.

## OBJECTIVES OF INDUSTRIAL EDUCATION

The Industrial Education Program can help achieve the Goals of Schooling and Education. The course objectives are more focused and give direction to the teacher.

The objectives of Industrial Education are classified in three areas with the following purposes:

A. Personal Growth:

To provide opportunities for the individual growth of the student through the development of acceptable personal and social values necessary in a productive society.

1. To provide a technical environment which motivates and stimulates individuals to discover their interests and develop personal and social responsibilities.

2. To assist in the development of positive attitudes toward safety.

3. To assist in the development of positive attitudes toward conservation and environment.

4. To assist in the development of consumer literacy.

B. Career Exploration:

To provide students with experiences which will assist them in making realistic career choices.

1. To provide students an opportunity, within a technical environment to become acquainted with the general occupational characteristics of a variety of career fields.

2. To relate their own interests, abilities, likes, dislikes and values to several career fields.

C. Occupational Skills:

To develop basic competencies, integrating cognitive and psychomotor skills related to families of occupations.

1. To provide safe exploratory experiences in the use of tools, energy, equipment and materials appropriate to various technologies prevalent in a productive society.

2. To develop an understanding of the interrelationships of various technologies.

3. To provide a technical environment which permits students to synthesize their accumulated knowledge in the solution of practical problems, and to assist students to develop habits that will be conducive to the establishment of a safe environment.

# INDUSTRIAL EDUCATION 12, 22, 32 PROGRAM

## INTRODUCTION

The Industrial Education 12, 22, 32 program is a series of modules which develop competencies leading to six different career fields.

Entry into a career field may be gained by taking one of several introductory courses. These are:

1. the "12" course designated for each major, or

2. two modules from the Industrial Education "10, 20, 30" series related to the anticipated major, or

3. one half of a "12" course. The other half would be another half "12" or a module from the "10" program. The course would be recorded as Industrial Education "10".

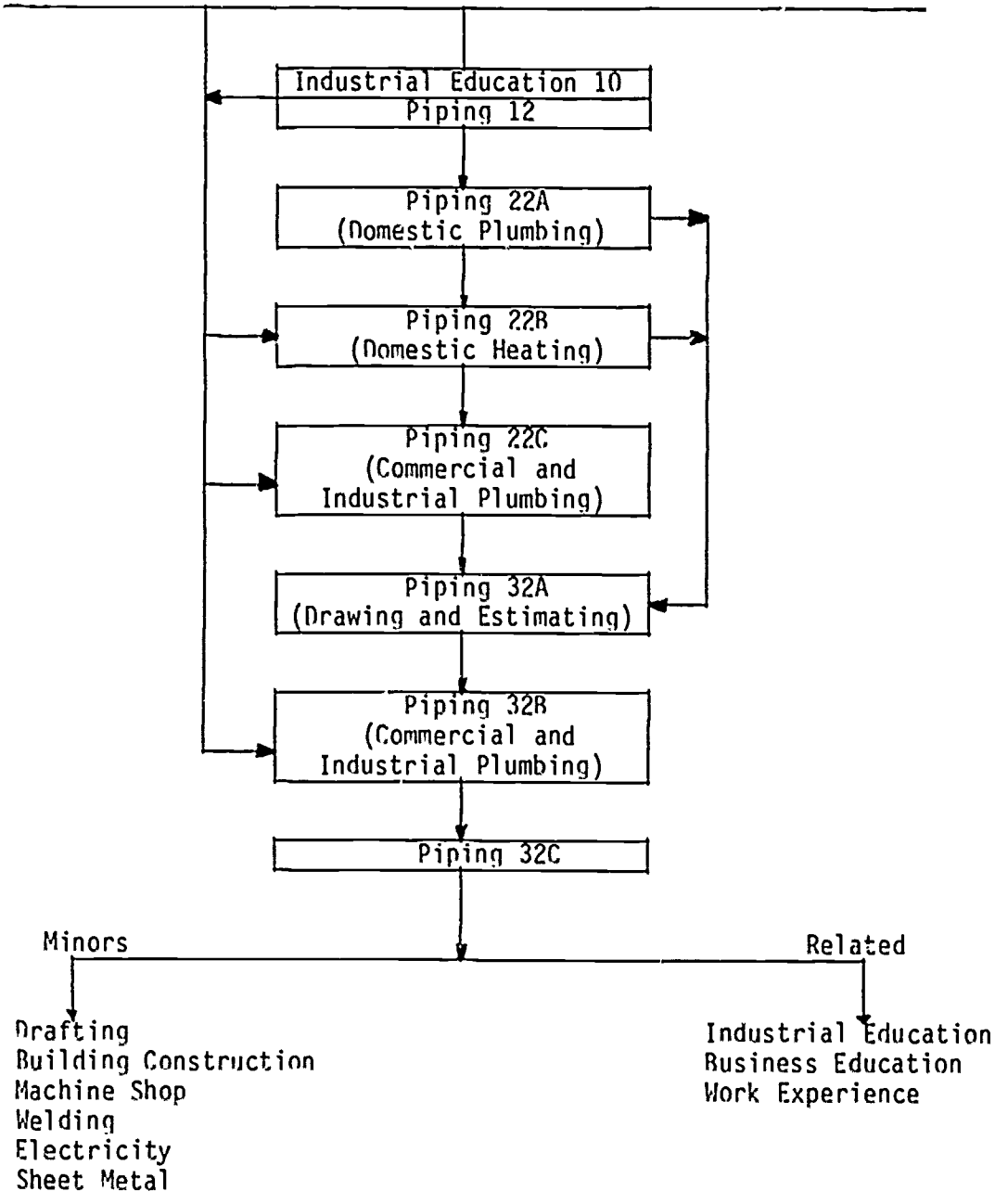
Following the introductory course the student may advance to the major area of study by selecting any number of five credit modules from the courses designated as "22" or "32". The scheduling and sequencing of the modules is the responsibility of the local school personnel but must be in accordance with the regulations pertaining to prerequisites.

A student registered in a second or third level course ("22" or "32") is regarded as taking a major in that course area. Having established a major the student may select courses designated as minors and in this way broaden his/her practical skill base in a career field or even several career fields. However, students must complete all the preceding modules in a major series (usually six) before taking the 32C module (exception: Beauty Culture).

# CAREER FIELD

## CONSTRUCTION AND FABRICATION

### Piping



## CAREER OPPORTUNITIES

Piping is a vocational program designed to give students at least first year proficiency in pipe trades and thereby one less year to serve in apprenticeship upon successful completion of the course and apprenticeship exams.

Students having taken all or most of the modules in the major sequence may look forward to the following career opportunities.

Piping 12-22-32 (35 credits)

| Post High School Studies | Career |
|---|---|
| N.A.I.T. or S.A.I.T. | Apprenticeship as: |
| Petroleum Technology | Plumber |
| Engineering Graphics | Gasfitter |
| Gas Technology | Steamfitter |
| Environmental Technology | Foreman |
| Air Conditioning and Refrigeration Technology | |
| Instrumentation Technology | Inspector of<br>- plumbing<br>- gas fitting<br>- apprentices |
| Power Engineering Technology | |
| UNIVERSITY | |
| Teaching at N.A.I.T., S.A.I.T. or High School | Sales |

# PIPING 12

# COURSE CONTENT

## PIPING 12 (5 CREDITS)

### INTRODUCTION

Piping 12 is the introductory course to the Piping modules. It provides students with experiences found in the career field and an overview of the trade area so that an informed decision may be made about future studies.

### OBJECTIVES

The objectives of the Piping 12 course are:

1. To give the student an understanding of the various pipe trades; plumbing gasfitting, steamfitting, sprinkler fitter, solar heating pipework, etc.

2. To introduce the student to the safe use of tools and procedures peculiar to the piping industry.

3. To provide an exploratory experience for career choice decision making.

### LEARNING RESOURCES

*Meikle, H.E., Plumbing From the Ground Up, Holt, Rinehart and Winston. Latest Edition.

Blankenbaker, E.K. Plumbing, Goodheart-Willcox. Latest Edition.

Ripka, L.V., Plumbing Installation and Design, American Technical Society.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Career Fields

   - variety of occupations
   - employment opportunities

2. Trade Study

   - apprenticeship and certification
   - structure of the piping industry
   - history and union organization

3. Safety

4. Measurement

   - systems; metric, S.I.; English; U.S.
   - use of instruments
   - layout

5. Pipe Tools and Methods of Joining Pipe

   - threading
   - soldering
   - cementing (gluing)
   - M.J. joints
   - description of older joints such as caulking, wiping etc.

6. Adapting Pipes and Fittings

   - steel to copper
   - cast iron to plastic
   - substituting one pipe for another as in renovation and service work

7. Identifying, Selecting and Ordering Materials

   - "Reading" fittings
   - identifying various pipe materials, sizes and fittings
   - valve functions; gate, globe, etc.

TOPIC 1: CAREER FIELDS VP12

GENERALIZATION: There are many occupations within and related to the career field of construction and fabrication.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Occupational Information:<br>- occupations | - research the occupations available with a variety of career areas, such as:<br>- building construction<br>- pipe trades<br>- sheet metal, heating, air conditioning, solar heating<br>- welding<br>- machine shop | 6 | Apprenticeship Board Speakers, Videotapes, Field Trips. |
| - educational requirements | - list the educational requirements for entry to specific careers | | |
| - employment opportunities | - survey journals, magazines and newspapers and compile statistics which reflect employment opportunities in the various trade areas:<br>- locally<br>- regionally<br>- nationally | | |
| - trade certification and licensing requirements | - explain journeyman's certificate and masters licensing, where applicable. | | |

NOTES:

TOPIC 2: TRADE STUDY - PIPE TRADES VP12

GENERALIZATION: People in the pipe trades perform important, vital and rewarding work in modern industrial society.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Trade Certification: | - record the apprenticeship requirements for certification in pipe trades, provincially and nationally. | 6 | |
| - requirements | - list the educational requirements and state the time involved and wage rates available at the different stages as an apprentice. | | Apprenticeship Pamphlets |
| - major trades | - identify the specific trades in:<br>- plumbing<br>- gasfitting<br>- steamfitting<br>- sprinkler work | | Career Index |
| - related trades | - identify other areas which are related to pipe trades, such as:<br>- maintenance and service work<br>- instrumentation work on pneumatics<br>- oil field work<br>- wholesale and sales work | | |
| - working conditions | - discuss the organzations which impact on working conditions, such as:<br>- government<br>- associations<br>- unions<br>- management | | |

NOTES:

TOPIC 2: TRADE STUDY - PIPE TRADES (continued) VP12

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| - union organization | - discuss union involvement in areas, such as:<br>- collective bargaining<br>- labor act<br>- apprenticeship standards<br>- trade contests<br>- other | | |

TOPIC 3: SAFETY VP12

GENERALIZATION: Safe practises are essential in all shop and industrial activities.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 1. Unsafe Acts | The student will:<br>- describe some of the consequences of unsafe acts when working on construction and in the school shop<br>- describe the safe methods for:<br>- lifting<br>- climbing and descending ladders<br>- tying correct knots on ropes<br>- using pulleys<br>- trenching<br>- handling gases | | Films and Pamphlets |

NOTES:

TOPIC 3: SAFETY (continued) VP12

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 2. Unsafe Conditions | - discuss how to identify conditions which might lead to injuries on the job | | |
| 3. Workers Compensation | - list the benefits available under the Workers' Compensation Act | | St. Johns Ambulance Personnel |
| 4. First Aid | - demonstrate and discuss simple first aid and techniques for handling:<br>- cuts and bruises<br>- broken bones<br>- demonstrate correct artificial respiration methods | | |

TOPIC 4: MEASUREMENT VP12

GENERALIZATION: Accurate measurement and layout are essential in the construction and fabrication of materials.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Measurement Systems: | - discuss the base 10 number system | | |
| - metric | - use other base systems in calculations, e.g. base 8 | | |
| | - use metric (SI) system of measurement | | |
| - English | - discuss the English system of measurement | | |

TOPIC 4: MEASUREMENT (continued) VP12

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | - use the English system of measurement | | |
| - other systems | - discuss the binary system | | |
| | - use the binary system in calculations | | |
| 2. Measuring Instruments | - use common measuring instruments, such as:<br>- tapes<br>- levels<br>- plumb bobs<br>- thermometers | | |
| 3. Laying out pipes and fittings | - cut and join various piping materials and fittings with attention to trade measurement practices, for:<br>- end to end<br>- end to centre<br>- end to face | | |
| | - practise cutting and threading using trade techniques which prevent waste | | |
| 4. Measuring Piping Offsets | - given formulae, measure, layout, cut, thread and assemble pipes and fittings using:<br>- $45^0$ offset<br>- $60^0$ offset<br>- 22 $1/2^0$ offset<br>- rolling offset | 15 | |

NOTES:

TOPIC 5: PIPING TOOLS AND METHODS OF JOINING PIPE VP12

GENERALIZATION: A knowledge of the purpose and use of piping tools, joints and materials is basic to the piping of a building or plant.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Joining pipe: | | 40 | |
| - threading | - thread pipes of various diameters, according to safe trade practices, using:<br>- hand operated dies<br>- power operated dies | | |
| | - identify tools and materials required for a small pipe assembly and complete the assembly | | |
| | - test a simple pipe assembly for:<br>- accuracy<br>- workmanship<br>- tightness of joints | | |
| - soldering | - using correct tools and materials solder pipes and fittings, emphasizing:<br>- cleaning<br>- fluxing<br>- heat application<br>- capillary action | | |
| - mechanical joints | - using correct tools and materials make an M.S. joint of cast iron pipe and fittings | | |
| - gluing | - using correct tools and materials make a pipe assembly using:<br>- black plastic (A.B.S.)<br>- grey plastic (P.V.C.) | | |

NOTES:

TOPIC 5: PIPING TOOLS AND METHODS OF JOINING PIPE (continued) VP12

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| - other | - discuss other methods of joining pipe, such as:<br>- caulking<br>- P.C.4 | | |

TOPIC 6: ADAPTING VARIOUS PIPES AND FITTINGS TO ONE ANOTHER VP12

GENERALIZATION: In plumbing it is essential to be able to adapt, substitute and convert one pipe or fitting to another.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Adapting pipe and/or fittings | - given various pipes and fittings convert from one to another in the following manner:<br>- steel to copper<br>- M.J. to plastic<br>- adaptors, ferrules | 10 | |
| | - use the above methods in a project | | |
| 2. Substituting pipe and/or fittings | - given a variety of pipes and fittings substitute one for another according to common trade practice, e.g. replacing a plug with a nipple and cap | | |

NOTES:

TOPIC 7: IDENTIFYING, SELECTING, ORDERING MATERIALS AND READING FITTINGS VP12

GENERALIZATION: A knowledge of the materials and fittings used in piping is essential for a trades person.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Reading fittings | - read fittings in order to pick them from stock<br>- identify fittings on display | | |
| 2. Identifying and selecting materials | - select materials appropriate for a job according to:<br>- weight of pipe<br>- types of pipes<br>- length of pipe<br>- N.P.S. sizes | | |
| 3. Function of Valves | - select valves according to their size, type and function:<br>- gate; stop and start flow<br>- globe; throttling<br>- check; preventing back flow<br>- T.P.R.; preventing high pressure or high temperatures<br>- pressure regulating<br>- electric, pneumatic, etc.; automatic | | |

NOTES:

# PIPING 22A

COURSE CONTENT

PIPING 22A (5 CREDITS)
(Domestic Plumbing)

INTRODUCTION

Students may advance to Piping 22A from any of the following introductory courses; Industrial Education 10 or Piping 12.

OBJECTIVES

The objectives of the Piping 22A module are:

1. To provide the student with experience in following plumbing regulations.

2. To provide the student with the theory and experience necessary to "rough in" and finish domestic plumbing.

LEARNING RESOURCES

*Meikle, H.E., Plumbing From the Ground Up, Holt, Rinehart and Winston. Latest Edition.

Blankenbaker, E.K. Plumbing, Goodheart-Willcox. Latest Edition.

Ripka, L.V., Plumbing Installation and Design, American Technical Society.

Alberta Plumbing Code.

Alberta Gas Code.

Plumbing Fixture Rough-In Books.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Rough-In Procedures

   - plan, layout, cut holes
   - assemble and install drains and vents
   - install water lines
   - rough-in the bathtub

2. Finishing Procedures

   - ɐt water closet (toilet)
     ng or cut in lavatory basins or vanities
     ɹnnect water lines
     ,nstall water heater
   - finish and test

TOPIC 1: ROUGHING IN PROCEDURES VP22A

GENERALIZATION: A knowledge of the planning, assembling and installing techniques for plumbing a house during construction, is essential to domestic plumbing.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Drains, Vent and Traps | - given a blueprint or sketch of a house, following all code requirements, use a mock-up to:<br>- layout<br>- cut necessary holes<br>- assemble systems<br>- install pipes and fittings<br>- grade pipes<br>- support where necessary | | |
| 2. Water Lines for House | - given blueprint or sketch of a house "rough in" all water lines using copper or plastic pipes; a mock-up may be used for this assignment | | |
| 3. Bathroom | - using a mock-up install a bathtub or shower complete with attachments for waste, overflow, taps and water supply | | |

NOTES:

TOPIC 2: FINISHING PROCEDURES VP22A

GENERALIZATION: A knowledge of the procedures required to hang, set, install and connect rough in plumbing to finished fixtures and faucets is essential in plumbing a house.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Setting a Water Closet | - practise installing a water closet | 50 | |
| | - install a water closet in a house or mock-up where the roughed in plumbing is completed | | |
| 2. Lavatory Basin (any type) | - connect a lavatory basin to roughed in piping | | |
| 3. Bath Tub or Shower | - install the trim for a tub or shower | | |
| 4. Kitchen Sink, Dishwasher or Garburator | - connect a kitchen sink, dishwasher or garburator to the roughed in water and waste pipes | | |
| 5. Water Heater and Water Meter | - correctly locate the safety valve and connect the hot and cold pipes to a water heater; use a mock-up where possible | | |
| 6. Water Softener or Iron Remover | - install the water lines to a water conditioner and describe how to backwash the system; use a mock-up where possible | | |

NOTES: After completing Topic 1 and 2 the student should understand the applicable codes and have the skills necessary to complete the plumbing of a typical house.

# PIPING 22B

COURSE CONTENT

PIPING 22B (5 CREDITS)
(Domestic Heating)

INTRODUCTION

Students may advance to Piping 22B from any one of the introductory courses; Industrial Eduation 10 or Piping 12.

OBJECTIVES

The objectives of the Piping 22B module are:

1. To provide the student with learning experiences in the correct installation of hot water heating equipment for a house (home).

2. To provide the student with learning experiences in the correct and safe installation of gas burning appliances.

LEARNING RESOURCES

*Blankenbaker, E.K. Plumbing, Goodheart-Willcox. Latest Edition.

Alberta Provincial Plumbing Code.

C.S.A. Gas Code.

Pipefitter Handbook by Frankland.

Trane Company Publication in Two Volumes on Steam and Hot Water Heating.

National Building Code of Canada - Plumbing section.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Hot Water Heating

   - sizing and erecting a boiler
   - selecting and installing radiation and convection systems
   - insulating and preparation for operation
   - adjusting and setting controls

2. Gasfitting

   - domestic
   - planning, sizing, laying out, installing and testing gas piping in a house
   - sizing and erecting gas appliances
   - activating, adjusting, setting and servicing gas appliances
   - venting gas appliances for domestic use
   - converting gas appliances for domestic use

TOPIC 1: HOT WATER HEATING VP22B

GENERALIZATION: A knowledge of the theory and installation skills necessary in heating a house with hot water is an essential part of piping.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Hot Water Boiler | - using a mock-up and given the manufacturers instructions, correct tools, and materials, erect a hot water heating boiler | 70 | |
| 2. Boiler Trim | - given the correct equipment and tools, install or attach the trim required on a hot water boiler | | |
| 3. Radiation and Convection Systems | - using a mock-up and after proper guidance, select and install the proper radiation or convection system for a home; discuss the types of baseboard heating available | | |
| 4. System Testing | - insulate hot water heating system and prior to operating test the system using:<br>- water in summer<br>- air in winter | | |
| 5. Adjusting System | - remove air from a hot water heating system and adjust and set the various controls for correct operation | | Boiler and Pressure Vessel Act |

NOTES: This module may be taught as a separate module from all others except #1 or along with the Module on Solar Heat.

TOPIC 2: GASFITTING - DOMESTIC VP22B

GENERALIZATION: A knowledge of the components, characteristics, dangers and application of gas as a fuel for heating homes is essential to the piping industry.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Gas Piping | - given specific information on procedure; plan, size, lay out, install and test the gas piping for a typical home | | |
| | - hook up the gas piping, meter and appliances in a typical on-the-job, three appliance installation | | |
| 2. Gas Appliances | - size, locate, erect and install gas appliances such as furnace, water heater, stove, etc. | | |
| | - activate, adjust and connect various gas appliances according to gas code requirements | | |
| 3. Servicing | - given appropriate information, locate, set, adjust, and service typical gas and electrical controls used with gas appliances | | |
| 4. Home Appliances | - locate, correctly set and adjust gas controls on appliances commonly found in the home | | |
| 5. Venting | - vent appliances, according to gas code requirements, with attention to the following draft conditions: positive, negative and neutral | | |

NOTES: Vents should be to the outside to gain the best results.

TOPIC 2: GASFITTING - DOMESTIC (continued) VP22B

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 6. Converting Appliances | - following the correct procedure change the orifice on an appliance to convert from propane to natural gas, or vise versa | | |

NOTES: Consult CSA Standard Gas Codes for propane and natural gas.

# PIPING 22C

COURSE CONTENT

PIPING 22C (5 CREDITS)
(Commercial and Industrial Heating)

INTRODUCTION

Students may advance to Piping 22C after having completed any of the introductory courses, Industrial Education 10 or Piping 12.

OBJECTIVES

The objective of the Piping 22C module is:

1. To provide the student with experiences in the installation of low pressure steam heating equipment.

LEARNING RESOURCES

*Blankenbaker, E.K. Plumbing. Goodheart-Willcox. Latest Edition.

Ripka, L.V., Plumbing Installation and Design, American Technical Society.

Alberta Provincial Plumbing Code.

C.S.A. Gas Code.

Pipefitter Handbook by Frankland.

Trane Company Publication in Two Volumes on Steam and Hot Water Heating.

National Building Code of Canada - Plumbing section.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Low Pressure Steam Heating

   - sizing, erecting and installing a low pressure steam boiler
   - selecting and installing radiators, convectors and unit heaters
   - adjust and set controls

2. Applications of Steam Other Than for Heating

   - commercial uses of steam other than for heating
   - hanging and supporting pipe
   - expansion and contraction allowances

TOPIC 1: LOW PRESSURE STEAM HEATING VP22C

GENERALIZATION: A knowledge of the theory and installation techniques for equipment using steam for heating purposes is essential to the industrial and commercial pipefitter.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Low Pressure Steam Boiler | - size, erect and install a steam boiler according to the requirements of the Boiler and Pressure Vessel Act and trade practices<br>- install the boiler and necessary trim, piping and heating units in a framed mock up | | |
| 2. Boiler Trim | - given the correct information on procedures, attach boiler trim | | |
| 3. Radiators, Convectors and Unit Heaters | - given the information required, select and install various types of heating systems which use steam as a heating medium | | |
| 4. Operation | - insulate and prepare a finished steam boiler for operation, (observing the above may suffice)<br>- go on a field trip to the school boiler room or other suitable site | | |

NOTES:

TOPIC 1: LOW PRESSURE STEAM HEATING (continued) VP22C

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 5. Adjusting and Setting Controls, Condensate Pumps, etc. | - adjust and set controls and pumps on a finished steam boiler and piping system<br>- hook up the steam and condensate lines necessary for a steam coil in a hot water storage tank | | |
| 6. Indirect Heating with Steam, such as Heating Coils for Hot Water, etc. | - given the proper information install indirect heating system coils in equipment | | |

NOTES: A minor module in framing and concrete forming plus welding and air conditioning will help students in this Topic.

TOPIC 2: APPLICATIONS OF STEAM AND OTHER HEATING VP22C

GENERALIZATION: A knowledge of the many applications of steam for purposes other than heating gives flexibility and scope to the pipe tradesman's skills.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 1. Industrial and Commercial Site Visits | The student will:<br>- discuss the complexity of heating applications in industry following visits to systems in use around the area<br>- go on field trips to a commercial laundry, a refinery, school boiler room, etc. | 20 | |

TOPIC 2: APPLICATIONS OF STEAM AND OTHER HEATING (continued) VP22C

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 2. Hanging and Supporting Pipe | - hang and support pipe using varied types of hanger and supports, such as:<br>- solid ring<br>- hanging strap<br>- hanging rod<br>- "C" clamps<br>- other | | |
| 3. Expansion and Contraction | - discuss expansion and contraction of pipe and allow for expansion or contraction in steel, copper, or plastic piping in particular, when installing systems<br><br>- use expansion joints, swing joins and other fittings which allow for pipe movement on shop projects, or observe them on field trips | | |

NOTES:

# PIPING 32A

COURSE CONTENT

PIPING 32A (5 CREDITS)
(Drawing and Estimating)

INTRODUCTION

Students may advance to Piping 32A upon completion of one of the introductory courses, Industrial Education 10 or Piping 12 and also one "22" level module in Piping.

OBJECTIVES

The objectives of the Piping 32A module are:

1. To provide the student with opportunities to design and draw up two or three dimensional drawings for a domestic installation.

2. To provide the student with opportunities to interpret drawings and make cost estimates of materials and labor.

LEARNING RESOURCES

*D'Arcangelo, R. and Guest, J.R., Blueprint Reading for Plumbers, Delmar Publishers. Latest Edition.

*Galeno, J.J., Plumbing Estimating Handbook, Van Nostrand Reinhold, Latest Edition.

Trade "Roughing In" Books.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Symbols, Scales, Specifications, Rough-In Books, Drawing Instruments, Types of Lines and Drawings

   - use of drafting instruments
   - symbols, scales, lines and rough-in books
   - blueprint reading

2. Drawing Plans and Isometric Views of Piping

   - plan an elevation sketch
   - isometric drawing

TOPIC 1: SYMBOLS, SCALES SPECIFICATIONS, ROUGH-IN BOOKS, DRAWING INSTRUMENTS, TYPES OF LINES AND DRAWINGS VP32A

GENERALIZATION: A knowledge of the tools, techniques, and language of blueprints is essential to planning piping in a building.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Using the Drafting Instruments | - given the information, use the drafting instruments such as the board, "T" square, 60°/30° set square, pencils, etc. | 30 | |
| | - practise using these tools to produce simple drawings | | |
| 2. Symbols, Scales, Lines and Rough-In Books | - given the information, use symbols, scales, lines, and rough in books in completing drawings and reading blueprints | | |
| | - draw simple objects and read blueprints from jobs such as the school blueprint, if available | | |
| 3. Blueprint Reading | - given the terms and their explanation, understand the language used in blueprinting and the importance of the accompanying specifications | | |
| | - use a set of blueprints and specifications in a shop assignment | | |

NOTES: A minor in basic drafting and blueprint reading could be a co-requisite with this course.

TOPIC 2: DRAWING PLANS AND ISOMETRIC VIEWS OF PIPING VP32A

GENERALIZATION: The ability to interpret blueprints from the two dimensional to three dimensional (isometric) helps a pipe tradesman in laying out work.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Plan and Elevation Sketch | - given the proper information in Topic #1, and the principles of orthographic projection, draw two dimensional views of a simple object | | |
| | - draw simple objects, such as a block of wood | | |
| 2. Isometric Drawing | - with the proper instruments and information, draw a simple object in isometric, then a simple one line isometric of a piping lay out | | |
| | - draw isometric freehand in order to take the two dimensional plan view and give it perspective | | |
| | - with the proper instruments and information, draw a simple object in isometric, then a piping lay out | | |
| | - using an isometric drawing, make a materials list and estimate material and labor costs | | |

NOTES: This is an applied and practical drafting module, with the emphasis on Plan to Isometric (perspective) to Actual Job Use. Lettering, etc. is of little importance.

# PIPING 32B

COURSE CONTENT

PIPING 32B (5 CREDITS)
(Commercial and Industrial Plumbing)

INTRODUCTION

Students may advance to Piping 32B from one of the introductory courses, Industrial Education 10 or Piping 12. This course is best taken in combination with any of the other "22" or "32" level courses.

OBJECTIVES

The objectives of the Piping 32A module are:

1. To provide the student with the opportunity to design piping techniques for commercial buildings.

2. To provide the student with the opportunity to practise installation techniques for commercial buildings.

LEARNING RESOURCES

*Meikle, H.E., Plumbing From the Ground Up, Holt, Rinehart and Winston, Latest Edition.

*Blankenbaker, E.K., Plumbing, Goodheart-Willcox, Latest Edition.

Ripka, L.V., Plumbing Installation and Design, American Technical Society.

Alberta Plumbing Code.

*Refers to prescribed learning resources.

CONTENT SUMMARY

1. Roughing In and Finishing Procedures in Multiple Storied Buildings or Industrial Plants

   - drains in large buildings
   - sleeves and inserts in large buildings
   - prefabrication techniques
   - wall hung fixture
   - sizing rain water leaders
   - "soventing" techniques

TOPIC 1: ROUGHING IN AND FINISHING PROCEDURES IN MULTIPLE STORIED BUILDINGS OR INDUSTRIAL PLANTS VP32B

GENERALIZATION: A knowledge of the techniques required to size and install the venting and drainage in large buildings is essential to the pipe tradesman.

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| | The student will: | | |
| 1. Drains in Large Buildings | - given the plumbing code and the fixture unit principle, size vents and drains in a large building<br>- use shop drawings, blueprints, or schematics for illustrating these ideas and procedures | | |
| 2. Sleeves and Inserts in Large Buildings | - given information on blueprint reading and industrial construction techniques, install sleeves and inserts for running risers, stacks and hangers in construction other than wood<br>- visit jobs under construction to observe these procedures and inspect sleeves, inserts, etc. | | |
| 3. Prefabrication Techniques | - given shop drawings, make up sections of the plumbing prior to installation on the job; this can be done in copper, M.J. or plastic piping | | |

NOTES:

TOPIC 1: ROUGHING IN AND FINISHING PROCEDURES IN MULTIPLE STORIED BUILDINGS OR INDUSTRIAL PLANTS (continued) VP32B

| CONCEPTS/SUBCONCEPTS | LEARNING TASKS | HOURS | REFERENCES |
|---|---|---|---|
| 4. Wall Hung Fixture | - complete a shop project involving multiple water closets or lavatory basins, vented and drained in accordance with code and trade practice<br>- given the correct information procedures, install fixtures associated with larger buildings<br>- install at least one wall hung fixture | | |
| 5. Sizing Rain Water Leaders | - given the plumbing code and the correct procedures, correctly size rain water leaders and storm drains<br>- with the knowledge available on this development in plumbing discuss some of the future implications | | |
| 6. "Soventing" Techniques | - compare the traditional system of plumbing tall buildings with the sovent system by comparing isometrics of both; see note below | | |

NOTES: Sub-Concept #6 is illustrated in the Copper Development Association Magazine, Edition #47, Winter 1971. The Alberta Provincial Plumbing code is the Authority here. City code can be used as comparison.

# PIPING 32C

## COURSE CONTENT

## PIPING 32C (5, 10 CREDITS)

The last module in the Piping sequence is open to students who have completed 30 credits or six modules in the major.

The 125 hours of instruction time available in this module may be used to:

a. Provide greater depth to a module taken previously. Individual students, groups of students, or the whole class may elect to study an area in more detail. This could be in domestic plumbing, commercial plumbing, heating, air conditioning, or any of the modules named in the Piping sequence.

b. Engage in actual pipe fitting or plumbing work supervised by the Piping teacher as a coordinator and a journeyman on the job.

c. Apply some of the time in work study or work experience now common in many schools in the province.

d. Study the recently designated sprinkler fitter trade and develop skills from earlier units which might apply.

e. Introduce more advanced students to solar heating systems i) passive, ii) active, or iii) those systems which will use solar panels to supplement existing heating systems for buildings or water supply.

## LEARNING RESOURCES

Daniels, F., Direct Use of the Sun's Energy, Ballantine Books, New York. Latest Edition.

Hand, A.J., Home Energy-How To, Popular Science Books, New York.

Fleck, P.A. Editor, Solar Energy Handbook, Time-Wise Publications, Pasadena, California.

*Refers to prescribed learning resources.