A PLAN OF TRAINING

FOR

STEAMFITTER / PIPEFITTER

OCCUPATION

Approved by
Provincial Apprenticeship and Certification Board

July, 1996
Revised June, 2000

Foreword

Apprenticeship training in the Province of Newfoundland and Labrador is undergoing considerable change. This change is prompted by the need to keep pace with technological changes in industry, the need to be competitive, and the desire to be efficient and effective in meeting the needs of the apprentice. We feel that this training plan will lay the groundwork to meet both the demands of industry and the needs of the apprentice.

The plan that follows is a comprehensive one. It recognizes that apprenticeship training begins when a student first registers at a training institution, or signs a Contract of Apprenticeship with an employer, and continues until such time as the apprentice has completed all of the required technical training and has received the required industry experiences necessary to write an interprovincial examination. Passing this examination will result in the apprentice receiving Red Seal Certification which gives the journeyperson national mobility of qualifications. This plan also recognizes the need to provide flexible access to training based on the needs of the employer and the apprentice while at the same time recognizing the end goal is to complete the requirements for Red Seal Certification.

It is realized that change in all facets of education and industry is continuous and sometimes rapid. This change will necessitate the review of this document on a continuous basis to ensure that current needs of industry and apprentices are being satisfied. Through a process of accreditation, regular input from industry advisory committees, as well as input from those involved in the administration and delivery of the training, we are confident that residents of our province who elect to pursue an apprenticeable occupation as a career choice will receive high quality training and thus will be prepared to compete for jobs worldwide.

Chair Provincial Apprenticeship and Certification Board	Minister Education

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CONDITIONS GOVERNING APPRENTICESHIP TRAINING

1.0 GENERAL

The following general conditions will apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board in accordance with the Apprenticeship Act. Where an occupation requires additional conditions, these will be noted in the specific plan of training for that occupation. In no case should there be a conflict between these conditions and the additional requirements specified in certain plans of training.

2.0 ENTRANCE REQUIREMENTS

2.1 Entry into the occupation as an apprentice requires:

The completion of designated first year courses specific to the occupation

OR

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in this plan of training.

OR

Enrolment in a program of studies that includes all entry and advanced level skills and required work experiences as approved by the Provincial Apprenticeship and Certification Board.

2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent and in addition may be required to have completed certain academic subjects as specified in particular plans of training. Mature students, at the discretion of the Director of Institutional and Industrial Education, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.

2.3 At the discretion of the Director of Institutional and Industrial Education, credit towards the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 A Registration for Apprenticeship form must be duly completed.

3.0 PROBATIONARY PERIOD

The probationary period for each memorandum of understanding will be six months. Within that period the memorandum may be terminated by either party upon giving the other party and the Provincial Apprenticeship and Certification Board one week notice in writing.

4.0 TERMINATION OF A MEMORANDUM OF UNDERSTANDING

After the probationary period referred to in Section 3.0 herein, the memorandum of understanding may be terminated by the Board by mutual consent of the parties thereto or cancelled by the Board for proper and sufficient cause in the opinion of the Board.

5.0 APPRENTICESHIP PROGRESSION SCHEDULE AND WAGE RATES

5.1 Progression Schedule

7200 Hour Programs	**Requirements for Progression**	**Progress To**
First Year Apprentice	25% of Course Credit Hours, **Plus** relevant work experience totaling 1800 hours	Second Year
Second Year Apprentice	50% of Course Credit Hours, **Plus** relevant work experience totaling 3600 hours	Third Year
Third Year Apprentice	75% of Course Credit Hours, **Plus** relevant work experience totaling 5400 hours	Fourth Year
Fourth Year Apprentice	100% of Course Credit Hours, **Plus** completion and sign-off of workplace skills required for certification totaling 7200 hours	Write Certification Examination
5400 Hour Programs		
First Year Apprentice	33% of Course Credit Hours, **Plus** relevant work experience totaling 1800 hours	Second Year
Second Year Apprentice	66% of Course Credit Hours, **Plus** relevant work experience totaling 3600 hours	Third Year
Third Year Apprentice	100% of Course Credit Hours, **Plus** completion and sign-off of workplace skills required for certification totaling 5400 hours	Write Certification Examination

4800 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	33% of Course Credit Hours, **Plus** relevant work experience totaling 1600 hours	Second Year
Second Year Apprentice	66% of Course Credit Hours, **Plus** relevant work experience totaling 3200 hours	Third Year
Third Year Apprentice	100% of Course Credit Hours, **Plus** completion and sign-off of workplace skills required for certification totaling 4800 hours	Write Certification Examination

5.2 For the duration of each Apprenticeship Training Period, the apprentice, who is not covered by a collective agreement, shall be paid a progressively increased schedule of wages which shall not be less than:

Program Duration	Wage Rates		Comments
7200 Hours	1st Year	55%	These wage rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice. No apprentice shall be paid less than the wage rate established by the Labour Standards Act (1988), as now in force or as hereafter amended, or by other Order, as amended from time to time replacing the first mentioned Order.
	2nd Year	65%	
	3rd Year	75%	
	4th Year	90%	
5400 Hours and 4800 Hours	1st Year	55%	
	2nd Year	70%	
	3rd Year	85%	
4000 (Hairstylist) - The apprentice shall be paid no less than the minimum wage for hours worked and a commission agreed upon between the apprentice and the employer.			

6.0 TOOLS

Apprentices shall be required to obtain hand tools as and when specified by the Board.

7.0 PERIODIC EXAMINATIONS

7.1 Every apprentice shall submit to such occupational tests and examinations as the Board shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Institutional and Industrial Education and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.

7.2 Upon receipt of reports of accelerated progress of the apprentice, the Board may shorten the term of apprenticeship and advance the date of completion accordingly.

8.0 GRANTING OF CERTIFICATES OF APPRENTICESHIP

Upon the successful completion of apprenticeship, the Board shall issue a Certificate of Apprenticeship

9.0 HOURS OF WORK

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

10.0 COPIES OF THE REGISTRATION FOR APPRENTICESHIP

The Director of Institutional and Industrial Education shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

11.0 RATIO OF APPRENTICES TO JOURNEYPERSONS

The ratio of Apprentices to Journeypersons normally shall not exceed one apprentice to every one journeyperson employed. Exceptions for specific occupations may occur with the approval of the Provincial Apprenticeship and Certification Board.

12.0 RELATIONSHIP OF THE PLAN OF TRAINING TO A COLLECTIVE BARGAINING AGREEMENT

Collective agreements take precedence over the conditions outlined in the plan of training.

13.0 AMENDMENTS TO A PLAN OF APPRENTICESHIP TRAINING

A plan of training may be amended at any time by the Provincial Apprenticeship and Certification Board.

14.0 EMPLOYMENT, RE-EMPLOYMENT AND TRAINING REQUIREMENTS

14.1 The plan of training requires Apprentices to attend regularly their place of employment.

14.2 The plan of training requires Apprentices to regularly attend training programs for that occupation as prescribed by the Provincial Apprenticeship and Certification Board.

14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their M.O.U.'s reinstated by the Provincial Apprenticeship and Certification Board but would be subject to a commitment to complete the entire program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.

14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or registering as a Trade Qualifier.

14.5 Under the plan of training the employer is required; to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give opportunity to be re-employed before another is hired.

14.6 The employer will permit each apprentice to attend regularly training programs as prescribed by the Provincial Apprenticeship and Certification Board.

14.7 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a training institution and have sign-off done by instructors to meet the requirements for certification.

15.0 APPEALS TO DECISIONS BASED ON CONDITIONS GOVERNING APPRENTICESHIP TRAINING

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Youth Services and Post-Secondary Education within 30 days of the decision.

REGULATIONS SPECIFIC TO THE
STEAMFITTER/ PIPEFITTER OCCUPATION

RATIO OF APPRENTICES TO JOURNEYPERSONS

Every approved shop may have one apprentice to every one journeyperson employed.

REQUIREMENTS FOR RED SEAL CERTIFICATION
IN THE STEAMFITTER/PIPEFITTER OCCUPATION

1. Evidence that the required work experiences outlined in this plan of training has been obtained. This evidence must be in a format that clearly outlines the experiences and a signature (s) of an appropriate person(s) attesting that these experiences have been obtained to the level required.

2. Normally have a combination of training from an accredited training program and suitable work experience totalling 7200 hours

   Or

   Have a total of 9000 hours of suitable work experience.

3. Completion of a National Red Seal examination to be set at a place and time determined by the Industrial Training Division of the Department of Youth Services and Post-Secondary Education.

4. Pay the appropriate examination fee.

ROLES AND RESPONSIBILITIES OF STAKEHOLDERS
IN THE APPRENTICESHIP PROCESS

Apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section captures, in a broad sense, these roles and the responsibilities that result from them.

Apprentices

- to complete all required technical training courses as approved by the Provincial Apprenticeship and Certification Board.
- to find appropriate employment
- to complete all required work experiences in combination with the required hours.
- to ensure that the work experiences are well documented
- to approach apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- to obtain the required hand tools as specified by the Board for each period of training of the apprenticeship program.
- to provide feedback to Training Institutions, the Industrial Training Division and Employers in an effort to establish a process of continuous quality improvement.

Employers

- to provide high quality work experiences in an environment that is conducive to learning.
- to remunerate apprentices as set out in the Plan of Training or Collective Agreements.
- to provide feedback to Training Institutions, Industrial Training Division and Apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, to release apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- to ensure that work experiences of the apprentices are documented

Training Institutions

- to provide a high quality learning environment.
- to provide the necessary student support services that will enhance an apprentices ability to be successful.
- to participate with other stakeholders in the continual updating of programs.

Industrial Training Division

- to establish and maintain provincial program advisory committees under the direction of the Provincial Apprenticeship and Certification Board.
- to promote apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved such as career guidance counsellor, teachers, parents, etc.
- to establish and maintain a protocol with apprentices, training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- to ensure that all apprentices are appropriately registered and records are maintained as required.
- to schedule all necessary technical training periods for apprentices to complete requirements for certification.
- to administer provincial/interprovincial examinations.

Provincial Apprenticeship and Certification Board

- to set policies to ensure that the provisions of the Apprenticeship Training Act are implemented.
- to ensure that advisory and examination committees are established and maintained.
- to accredit institutions to deliver apprenticeship training programs.
- to designate occupations for apprenticeship training and / or certification.

TS 1510 OCCUPATIONAL HEALTH AND SAFETY

Description:

This course is designed to give participants the knowledge and skills necessary to interpret the Occupational Health and Safety Act laws and regulations; understand the designated responsibilities within the laws and regulations; know the responsibilities importance of joint health and safety committees/representatives within the laws and regulations; examine right to refuse dangerous work; describe discriminatory action; explain duties of commission officers; interpret appeals of others; and, emphasize the reporting of accidents.

Prerequisites:

None

Course Outcomes:

Upon successful completion of this unit, the apprentice will be able to:
- prevent accidents and illnesses
- improve health and safety conditions in the workplace

Theory

1. Interpret the Occupational Health and Safety Act laws and regulations

    a. Explain the scope of the act
        - Application of the act
        - Federal/Provincial jurisdictions
        - Canada Labour Code
        - Rules and regulations
        - Private home application
        - Conformity of the Crown by the Act

2. Explain responsibilities under the Act & Regulations

    - Duties of employer, owner, contractors, sub-contractors, employees, and suppliers

3. Explain the purpose of joint health and safety committees

    - Formation of committee
    - Functions of committee
    - Legislated rights
    - Deviation from policy standards
    - Performance of other duties

- Health and safety representation
- Reasonable grounds for refusal
- Reporting endangerment to health
- Appropriate remedial action
- Committee recommendation
- Investigation of endangerment
- Employer's responsibility in taking remedial action

4. Examine right to refuse dangerous work

- Reasonable grounds for refusal
- Reporting endangerment to health
- Appropriate remedial action
- Committee recommendation
- Investigation of endangerment
- Employer's responsibility to take appropriate remedial action
- Action taken when employee does not have reasonable grounds for refusing dangerous work
- Employee's rights
- Assigning another employee to perform duties
- Temporary reassignment of employee to perform other duties
- Collective agreement influences
- Wages and benefits

5. Describe discriminatory action

- Definition
- Filing a complaint procedure
- Allocated period of time a complaint can be filed with the Commission
- Duties of an arbitrator under the Industrial Relations Act
- Order in writing inclusion
- Report to commission Allocated period of time to request Arbitrator to deal with the matter of the request
- Notice of application
- Failure to comply with the terms of an order
- Order filed in the court

6. Explain duties of commission officers

- Powers and duties of officers
- Procedure for examinations and inspections
- Orders given by officers orally or in writing
- Specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
- Service of an order

- Prohibition of persons towards an officer in the exercise of his/her power or duties
- Rescinding of an order
- Posting a copy of the order
- Illegal removal of an order

7. Interpret appeals of others

- Allocated period of time for appeal of an order
- Person who may appeal order
- Action taken by Commission when person involved does not comply with the order
- Enforcement of the order
- Notice of application
- Rules of court

8. Explain the process for reporting of accidents

- Application of act
- Report procedure
- Reporting notification of injury
- Reporting accidental explosion or exposure
- Posting of act and regulations

Practical:

Practical skills enhance the apprentices' ability to meet the objectives of this course. The learning objectives below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Describe work situations that one might want to refuse.

2. Interview someone in your occupation on two or more aspects of the act and report results.

TS1530 First Aid

Description:

This course is designed to give the apprentice the ability to recognize situations requiring emergency action and to make appropriate decisions concerning first aid.

Complete a **St. John Ambulance** Standard First Aid Certificate course.

TS 1520 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

Description:

This course is designed to give participants the knowledge and skills necessary to define WHMIS, examine hazard identification and ingredient disclosure, explain labeling and other forms of warning, and introduce material safety data sheets (MSDS).

Course Outcomes:

Upon successful completion of this course, the apprentice will be able to:

- interpret and apply the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health & Safety Act.

Required Knowledge and Skills:

1. Define WHMIS safety

    - Rational and key elements
    - History and development of WHMIS
    - WHMIS legislation
    - WHMIS implementation program
    - Definitions of legal and technical terms

2. Examine hazard identification and ingredient disclosure

    - Prohibited, restricted and controlled products
    - Classification and the application of WHMIS information requirements
    - Responsibilities for classification
    - the supplier
    - the employer
    - the worker - Classification: rules and criteria
    - information on classification
    - classes, divisions and subdivision in WHMIS
    - general rules for classification
    - class A - compressed gases
    - class B - flammable and combustible materials
    - class C - oxidizing material
    - class D - poisonous and infectious material
    - class E - corrosive material
    - class F - dangerously reactive material
    - Products excluded form the application of WHMIS legislation
        - consumer products
        - explosives

- cosmetics, drugs, foods and devices
- pest control products
- radioactive prescribed substances
- wood or products made of wood
- manufactured articles
- tobacco or products of tobacco
- hazardous wastes
- products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act
- Comparison of classification systems - WHMIS and TDG
- General comparison of classification categories
- Detailed comparison of classified criteria

3. Explain labeling and other forms of warning

- Definition of a WHMIS label
  - supplier label
  - workplace label
  - other means of identification
- Responsibility for labels
  - supplier responsibility
  - employer responsibility
  - worker responsibility
- Introduce label content, design and location
  - supplier labels
  - workplace labels
  - other means of identification

4. Introduce material safety data sheets (MSDS)

- Definition of a material safety data sheet
- Purpose of the data sheet
- Responsibility for the production and availability of data sheets
  - supplier responsibility
  - employer responsibility
  - workers responsibility

Practical

Practical skills enhance the apprentices' ability to meet the objectives of this course. The learning objectives below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Locate WHMIS label and interpret the information displayed.

2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

SUGGESTED RESOURCES:

1. WHMIS Regulation
2. Sample MSDS sheets

SUGGESTED COURSE LAYOUT FOR THE STEAMFITTER/ PIPEFITTER OCCUPATION

Program & Apprenticeship Registration

ENTRY LEVEL COURSES

PF1160 - Piping Shop Fundamentals	105hrs.
DR1700 - Basic Drawing & Sketching	75hrs.
WD1210 - Oxy-Fuel Cutting & Welding	60hrs.
WD1120 - SMAW Fundamentals	90hrs.
TS1300 - Rigging	45hrs.
PF1120- Ferrous Pipe Assembly	90hrs.
PF1130 - Non-Ferrous Pipe Assembly	45hrs.
PF1100 - Pipe Fabrication - Layout	45hrs.
PF1110 - Template Development	90hrs.
PF1170 - Pipe Blueprint Reading	60hrs.
PF2240 - Hot Water Heating Systems	105 hrs.
PF1300 - Low Pressure Steam Boiler Systems	90hrs.
*CM2150 - Workplace Correspondence	45hrs.
*MC1050 - Introduction to Computers	30hrs.
*SP2330 - QA/QC	30hrs.
*SD1720 - Entrepreneurial Awareness	15hrs.
*MR1210 - Customer Service	30hrs.
*SD1710 - Job Search Techniques	15hrs.
*SD1700 - Workplace Skills	30hrs.

*Related courses are to be interspersed throughout the program.

Required Work Experience(*if applicable)*

ADVANCED LEVEL COURSES

PF1330 - Alternate Heat Generators	45hrs.
PF2300 - Industrial Burners	45hrs.
PF2230 -Steam Systems	90hrs.
PF1210 - Piping & Heating Control Systems	45hrs.
PF2410 - Specialized Piping Systems	60hrs.
WA1120 - Fundamentals of Hydraulics & Pneumatics	90hrs.
RF1110 - Refrigeration Fundamentals	90hrs.
PF1220 - Pump Installation	45hrs.
PF2210 - Valves	45hrs.
PF2500 - Cross Connection Control	45hrs.
PF2440 - Specialty Piping	45hrs

Work Experience

Journeypersons Certification

TECHNICAL COURSE OUTLINES

NAME & NUMBER PF1160 - Piping Shop Fundamentals

DESCRIPTION

This general studies course requires the use of safety equipment, tools, fasteners, shop equipment and facilities and manuals. It involves the development of safety practices in the operation and maintenance of shop tools, equipment and facilities.. It includes information on general safety regulations, occupational health and safety, and fire prevention and suppression.

MAJOR TOPICS/TASKS

Practice safety; Complete the appropriate St. John's Ambulance First Aid Course for this occupation; Complete a Workplace Hazardous Materials Information Systems Course; Use and maintain gripping and turning tools, measuring devices and levels; Use and maintain flaring tools; Use and maintain cutting tools; Use and maintain threading devices; Install fasteners; Safely and effectively use, maintain and store pullers, drivers and presses; Solder metals; Use power tools; Drill materials; Cut metals (power); Grind and finish metals; Use explosive actuated tools; Use and maintain compressed air system; Use and maintain shop equipment

PURPOSE / AIMS

1. To gain an appreciation of the need for safety regulations in the operation and maintenance of shop tools, equipment and facilities
2. To be able to administer first aid and CPR
3. To develop an awareness of hazardous workplace materials

PREREQUISITES None

COURSE DURATION 105hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%

DATE DEVELOPED December 1993

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Practice safety
   a. List general workplace safety regulations
   b. List fire safety regulations
   c. Describe the operation and uses of different types of fire extinguishers
   d. Explain the safety standards prescribed by the Occupational Health and Safety Regulations
   e. Interpret occupational safety code
   f. Apply safe work habits at all times
   g. Use and maintain personal safety equipment
   h. Implement exhaust control procedures
   i. Use fire fighting equipment
   j. Respect noise level regulations
   k. Reduce factors that contribute to spontaneous combustion
   l. Identify potential hazards to personal safety
   m. Check for unsafe conditions
   n. Report accident

2. Complete the appropriate St. John's Ambulance First Aid Course for this occupation.

3. Complete a Workplace Hazardous Materials Information Systems Course

4. Use and maintain gripping and turning tools, measuring devices and levels
   a. Describe the use of the different types of precision measuring tools
   b. Describe the pliers (all types), screwdrivers (all types), wrenches (all types), clamps (all types) and vices (all types) used for fitting and assembling as per assigned information to within specifications required
   c. Use measuring tools (measuring tapes, rules, scale rules, calipers, micrometers, gauges, straight edges, plumb bobs, squares, and calculators) and levels
   d. Use pliers, screwdrivers, wrenches, torque multipliers, hammers and mallets and other gripping and turning tools
   e. Use torque wrench
   f. Use scribers and markers

5. Use and maintain flaring tools
   a. Describe types of tubing and flaring tools and explain the application of each
   b. Single and double flare tubing
   c. Bend tubing
   d. Measure and cut tubing
   e. Use compression fittings
   f. Anneal tubing before flaring as may be necessary
   g. Test and inspect flared fittings

6. Use and maintain cutting tools

a. Identify, maintain and use punches, chisels, files and saws
b. Sharpen chisels and twist drills and drill bits
c. Shape and sharpen a cold chisel
d. Maintain and store cutting tools
e. Cut sheet metal
f. Make bench projects
g. Cut bolts
h. Drill and ream holes

7. Use and maintain threading devices
   a. Explain the purpose of threading taps and dies
   b. Select and safely use proper tools for given job
   c. Maintain threading tools
   d. Make an internal thread
   e. Make and external thread
   f. Restore damaged thread
   g. Remove broken screw
   h. Use tap and drill chart

8. Install fasteners
   a. Describe safety requirements for using hand tools and fasteners
   b. Describe the different types of fasteners
   c. Explain oxidation, corrosion, tensile strength and shear strength
   d. Describe the types of fastener tools
   e. Describe as per the assigned information, rivets, keys, nuts, screws, pins, splines, studs, bolts, snaprings, bonds (thread locking compounds), washers, lock wires and self-locking nuts
   f. Use and identify fasteners such as rivets, nails, wood screws, sheet metal screws, bolts, nuts, washers, masonry anchors and shields
   g. Describe specific uses for each fastener
   h. Recognize sizes of fasteners
   i. Rivet and soft solder lap joint in galvanized sheet
   j. Torque bolts
   k. Identify bolt grades
   l. Identify miscellaneous anchoring devices

9. Safely and effectively use, maintain and store pullers, drivers and presses
   a. Describe types and explain the uses of pullers, drivers and presses

10. Solder metals
    a. Describe soldering tools, materials and applications
    b. Describe methods of tinning and soldering
    c. Describe types of solders
    d. Select solder and heating unit
    e. Solder wire connections, sheet metal, and copper fittings and tubing

f. Shut down and store equipment

11. Use power tools
    a. Describe the different types of power tools
    b. Describe the different types of hydraulic tools
    c. Describe safety requirements for using power tools
    d. Describe types of hydraulic and pneumatic lines and fittings and explain their applications
    e. Operate portable power tools
    f. Operate treading machines
    g. Operate power cleaning equipment
    h. Operate hydraulic punches, pullers, drivers and presses

12. Drill materials
    a. Describe the parts of a twist drill
    b. Describe drill sizes and speed requirements
    c. Describe types and uses of reaming tools
    d. Safely and effectively operate power drilling equipment (hammer and portable drill)
    e. Select and use cutting fluids
    f. Identify and select clamping devices
    g. Maintain drilling equipment

13. Cut metals (power)
    a. Explain the purpose of cutting power tools
    b. Safely and effectively use power operated saws, friction cut-off equipment and shears
    c. Maintain metal cutting power tools
    d. Identify and use abrasives

14. Grind and finish metals
    a. Describe types and explain applications of:
        I. portable and stationary grinders
        ii. grinding wheels
        iii. grinding discs
        iv. grinder dressers
        v. rotary wire brushes
    b. Install grinding wheel disc and brush
    c. Adjust tool rest
    d. Dress grinding wheel
    e. Safely and effectively operate stationary and portable grinders
    f. Maintain equipment

15. Use explosive actuated tools
    a. Select the proper tool for a specific use

b. Follow Occupational Health and Safety regulations
c. Choose the correct shot and fastener for the job
d. Apply safety practices while using explosive actuated tools
e. Fasten construction material to masonry and steel
f. Maintain and clean explosive actuated tools

16. Use and maintain compressed air system
    a. Describe types of compressors and components
    b. Demonstrate safety precautions when using and maintaining compressors
    c. Identify components of air controller (transformer)
    d. Use and maintain air controller (transformer)
    e. Use and maintain air and fluid hoses

17. Use and maintain shop equipment
    a. jacks
    b. shop cranes
    c. chain hoists
    d. steam cleaner
    e. solvent cleaning tanks

NAME & NUMBER DR1700 - Basic Drawing & Sketching

DESCRIPTION

This drafting course requires the use of basic drawings, specifications, bills of materials, drawing instruments and facilities, and CAD software and hardware. It involves reading basic drawings and diagrams, sketching, interpretation of specifications, and operating the CAD system. It includes information on sketching techniques, types of drawings, and CAD commands.

MAJOR TOPICS/TASKS

Construct geometric shapes and lines; Describe dimensioning; Sketch orthographic projections; Sketch sectional views; Sketch primary auxiliary views; Identify information from blueprints and drawings; Interpret specifications; Identify information from bill of materials; Operate the CAD system

PURPOSE / AIMS

1. To develop the skills and knowledge required to read drawings and sketch views.

PREREQUISITES None

COURSE DURATION 75 hrs

LEARNING RESOURCES

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED June 1996

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Construct geometric shapes and lines
   a. Draw lines to scale
   b. Scale lines
   c. Divide lines into equal parts
   d. Bisect lines
   e. Construct angles
   f. Bisect angles
   g. Construct concave and convex curves
   h. Construct circles, arcs, tangents, ellipses, polygons, etc.
   i. Explain the various methods of producing lines
   j. Describe the alphabet of lines
   k. List the basic drawing symbols

l. Explain what is meant by quality of lines
m. Describe metric, mechanical, architectural and civil scales
n. Describe the different types of pencil lead grades
o. Describe letter types
p. Describe lettering instrument types
q. Explain spacing, sizes and lettering techniques

2. Describe dimensioning
   a. Describe types of dimensions and lines used
   b. Explain the rules of dimensioning
   c. Explain the purpose and methods of dimensioning

3. Sketch orthographic projections
   a. Visualize object
   b. Select views
   c. Layout sketch
   d. Sketch projection
   e. Dimension sketch
   f. Make notations

4. Sketch sectional views
   a. Explain intersections and developments
   b. Explain conventions associated with sectional views such as symbols, cutting plane lines, broken-out lines, etc.
   c. Describe the purpose and types of sectional views
   d. Locate section
   e. Select type of view
   f. Determine scale
   g. Sketch view
   h. Dimension sketch
   i. Make notations

5. Sketch primary auxiliary views
   a. Describe different view orientations
   b. Describe obliques, isometrics and perspectives
   c. Explain sketching techniques
   d. Explain main view and possible views
   e. Describe the six principle views
   f. Explain association of surfaces
   g. Explain matching pictorials
   h. Visualize the view
   i. Layout the sketch
   j. Sketch view
   k. Dimension sketch
   l. Make notations

6. Identify information from blueprints and drawings
   a. Visualize views and projections
   b. Identify information from schematic diagrams, assembly drawings, views, feeder maps, etc.
   c. Identify sequence of fabrication according to blueprint
   d. Identify cut of materials from sketches
   e. Interpret horizontal, vertical, curved, inclined lines, fillets, and radii on working drawings
   f. Identify dimensions of holes, cylinders, circles, angles and arcs

7. Interpret specifications
   a. Interpret specifications
   b. Identify tolerance specifications
   c. Interpret specifications (company standards books)

8. Identify information from bill of materials

9. Operate the CAD system
   a. Explain the functions of the CAD system
   b. Start up the system
   c. Set up directories and manage files
   d. Start AutoCAD
   e. Operate the system

NAME & NUMBER WD1210 - Oxy-Fuel Cutting & Welding

DESCRIPTION

This OFW course requires the use of welding equipment and accessories, materials and supplies and safety equipment. It involves setting up OFW equipment; preparing, cutting and welding metal; and shutting down, disassembling and storing equipment. It includes information on safety requirements, cylinder pressures, combustion and flames, storage and transporting of cylinders, and types of regulators.

MAJOR TOPICS/TASKS

Set-up and use welding equipment (OFW); Set up and use cutting equipment; Fusion weld (OFW); Braze weld metals (OFW); Assemble metals using brazing process

PURPOSE / AIMS

1. To develop the skills and knowledge required for welding metal structures with respect to various codes and standards
2. To practice safety in potentially harmful situations

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 60hrs

LEARNING RESOURCES

Hobart Series
Welding Skills
New Brunswick Modules

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED December 1993

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Set-up and use welding equipment (OFW)
   a. Describe oxy-fuel equipment and components
   b. Explain lighting procedures and describe types of flame
   c. Demonstrate safety precautions when handling this equipment
   d. Set up, adjust equipment and check for leaks
   e. Light torch and make flame adjustments
   f. Shut down equipment and place in designated location

2. Set up and use cutting equipment
    a. Explain cutting procedures and equipment used
    b. List metals that can be cut and metals that cannot be cut
    c. Set up and adjust the cutting equipment for the assigned project
    d. Cut mild steel 90º FREEHAND
    e. Cut mild steel 90º GUIDED
    f. Cut mild steel at a 30º BEVEL FREEHAND
    g. Cut mild steel at a 30º BEVEL GUIDED
    h. Cut regular and irregular shapes FREEHAND
    i. Cut off bolt and/or nut FREEHAND (optional)

3. Fusion weld (OFW)
    a. Explain the procedure used to weld in the flat position
    b. Explain the steps in oxy-fuel welding
    c. Describe the types of metals that are suitable for the welding process
    d. Explain the steps in oxy-fuel cutting
    e. Describe types of flames, pressures and tip sizes and the application of each
    f. Prepare metal for welding
    g. Set up and adjust welding equipment
    h. Run fusion welding beads
    i. Weld mild steel single vee butt joint
    j. Weld mild steel open-corner butt joint
    k. Weld mild steel lap joint
    l. Fuse weld sheet metal

4. Braze weld metals (OFW)
    a. Describe braze welding processes as applied to various metals including cast iron
    b. Explain the purpose of filler metals in the brazing process
    c. Describe type of flame adjustment for brazing
    d. Prepare metal
    e. Set up and adjust welding equipment
    f. Tack weld metal
    g. Braze weld tee joint (m.s. in flat position)
    h. Braze weld butt joint (m.s. in flat position)
    i. Prepare and bronze weld cast iron
    j. Perform silver brazing

5. Assemble metals using brazing process
    a. Operate oxy-fuel equipment to assemble metals using the brazing process
    b. Prepare joints for brazing:
        i. 3/4 copper tee with fittings
        ii. tee joint (1/8x4x4 flat bar, m.s.)
    c. Braze tee joint 1/8x1x4 copper to mild steel
    d. Braze stainless steel tee joint (1/8x1x4"s.s.)

NAME & NUMBER WD1120 - SMAW Fundamentals

DESCRIPTION

This SMAW course requires the use of safety equipment, SMAW equipment and accessories, and materials and supplies. It involves setting up equipment, preparing and welding metal, shutting down equipment and testing the weld. It includes information on basic electricity, types of electrodes, types of welding machines, joint design and weld faults.

MAJOR TOPICS/TASKS

Describe welding methods; Explain proper procedures for handling heavy objects; Describe steel types and shapes; Set up equipment (SMAW); Strike and maintain arc (SMAW); Fillet weld flat (SMAW); Weld sheet metal (SMAW); Weld using various electrodes

PURPOSE / AIMS

1. To develop the skills and knowledge required for welding metal structures with respect to various codes and standards
2. To practice safety in potentially harmful situations

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 90hrs

LEARNING RESOURCES

Hobart Series
Welding Skills
New Brunswick Modules

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED May 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Describe welding methods
    a. Define the terminology associated with welding methods
        i. Explain or describe carbon steel electrodes, classification of mild steel and low alloy steel electrodes, operator protection, basic machine and circuit theory, AC & DC, Arc Blow, duty cycle, rated amperage, thawing pipes, striking and maintaining arc, stringer and weave beads, faults, safety

b. Describe the shielded metal arc welding process
c. List advantages and disadvantages of each arc welding process
d. Describe the potential discontinuities associated with welding processes
e. Explain appropriate inspection methods to locate discontinuities
f. Describe the five basic joint configurations
g. Describe applicable safety techniques
h. Describe the steps in the arc welding process
i. Explain the procedure used for welding in a flat position with SMAW
j. Explain joint types, designs and terminology

2. Explain proper procedures for handling heavy objects

3. Describe steel types and shapes
   a. Describe the characteristics of hot and cold rolled steel
   b. Determine the size of various structural shapes

4. Set up equipment (SMAW)
   a. Describe the equipment used for arc welding
   b. Explain the types and uses of SMAW machines and components
   c. Describe AC transformers, AC/DC rectifiers, DC generators, engine drive (gasoline, diesel) sources
   d. Set up SMAW equipment
   e. Install a ground clamp and/or terminal lug
   f. Maintain SMAW equipment
   g. Install an electrode holder with a terminal lug or jack plug connector
   h. Shut down and store equipment

5. Strike and maintain arc (SMAW)
   a. Explain why correct electrode selection, current, polarity settings, arc length, travel speed, and electrode angles important are important for quality welds
   b. Describe work and travel angles for weld metal deposition
   c. Deposit a stringer bead
   d. Deposit weave beads

6. Fillet weld flat (SMAW)
   a. Strike and maintain an arc
   b. Run stringer beads
   c. Run weave beads
   d. Weld joints:
      i. tee
      ii. lap
      iii. corner

7. Weld sheet metal (SMAW)
   a. Describe electrode types and sizes used for sheet metal welding

b. Describe the common joints used in sheet metal welding
c. Weld 16 gauge mild steel semi-vertical position, travel down:
    i. corner joint
    ii. butt joint
    iii. tee joint
    iv. lap joint
    v. edge joint

8. Weld using various electrodes
    a. Describe basic classifications and applications of electrodes
    b. Describe or explain electrode types for special applications, mild steel and low alloy electrodes, functions of flux coating, electrode identification, electrode prefix and suffix lettering system, identification of parent metal, welding position, power source, joint design and fit up, electrode diameter, metal properties, production efficiency, low hydrogen electrode, AWS and CSA electrode codes and champhertrode cutting
    c. Operate larger diameter electrodes for high speed deposit of quality welds on a production basis
    d. Demonstrate the proper setting for a variety of electrodes

NAME & NUMBER TS1300 - Rigging

DESCRIPTION

This general studies course requires the use of rigging equipment, ladders, block and tackle, and safety equipment. It involves installing, testing and maintaining rigging; and tying knots and splicing rope. It includes information on safety requirements, types of ropes, types of knots, slings, types of scaffolds, and types of ladders.

MAJOR TOPICS/TASKS

Use and maintain rigging equipment; Use and maintain overhead cranes; Use scaffolding and rigging

PURPOSE / AIMS

1. To develop the skills and knowledge required to install safe rigging

PREREQUISITES None

COURSE DURATION 45hrs

LEARNING RESOURCES

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED December 1993

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Use and maintain rigging equipment
    a. List the Occupational Health and Safety Regulations for rigging
    b. Describe the different types of ropes
    c. List the different kinds of knots
    d. Describe slings.
    e. Describe the different types of ladders
    f. Describe methods of lead balancing
    g. Describe the proper procedures and equipment for handling heavy objects
    h. Specify the use of screw jacks versus hydraulic units
    i. Recognize and use hand signals
    j. Recognize lifting capabilities
    k. Recognize necessity for swing staging
    l. Interpret occupational health and safety regulations
    m. Select and install ladders
    n. Install scaffolds

o. Demonstrate the safe and proper use of lifting equipment such as come-a-longs, chain falls, jacks, winches, overhead cranes, jacks, skids, cable tuggers, reeve blocks, slings and rope
p. Demonstrate proper use of knots
q. Use lifting attachments such as eye bolts and lifting lugs, beam clamps and crawlers, snatch blocks, spreader bars, shackles and screw jacks
r. Transfer loads using lifting equipment

2. Use and maintain overhead cranes
   a. Safely and effectively use overhead cranes
   b. Use proper lifting procedures
   c. Use hoisting and/or crane signals
   d. Use plate grab and/or slings

3. Use scaffolding and rigging
   a. Describe the different types of scaffolds
   b. Describe the safety factors to be considered when using swing staging
   c. Explain how suspended scaffolding is erected and when and how it is used
   d. Describe power scaffolding
   e. List safety rules for erecting and working on scaffolding (Safety in structural components)
      i. footboards
      ii. putlogs
      iii. braces
      iv. ties
      v. planking
      vi. scaffold brackets
   f. Describe special problems of rolling and suspended scaffolding
   g. Specify the use of elevators
   h. Describe types and conditions of approved work platforms
   i. Erect section of tubular steel sectional scaffold
   j. Describe adjustable tower scaffolding and advantages
   k. Inspect scaffolding before using
   l. Direct/assist in loading/unloading masonry units from trucks
   m. Direct/assist hoisting masonry units to work stations

NAME & NUMBER PF1120 - Ferrous Pipe Assembly

DESCRIPTION

This course in ferrous piping fundamentals requires the use of tools and equipment, and materials and supplies. It involves selecting, measuring, cutting, fitting and tack welding. It includes information on the assembly of different types of pipes and component parts.

MAJOR TOPICS/TASKS

Thread and assemble steel pipe; Assemble steel pipe for welding; Assemble cast iron pipe; Bend pipe; Maintain piping systems by coding, inspecting, maintaining and repairing; Fabricate and/or install hangers and supports

PURPOSE / AIMS

1. To develop the skills and knowledge required for assembling piping systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals
WD1120 - SMAW Fundamentals
WD1210 - Oxy-Fuel Cutting and Welding

COURSE DURATION 90hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED May 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Thread and assemble steel pipe
    a. Explain how to replace chasers and dies
    b. Explain how to cut and ream pipe by hand
    c. Explain how to cut ream and thread pipe by machine
    d. What tools are required to make fittings onto pipe
    e. How is a factory made nipple chuck used
    f. How is the 4PJ geared threader adjusted
    g. Calculate the end to end length of pipe between screwed fittings
    h. Explain how to align WN and screwed flanges to pipe
    i. Calculate the length of pipe required for 45° screwed offsets
    j. Select gasket material for high temperature water system, oil systems, cold water lines and high pressure steam systems
    k. Cut a ring and full face gasket for a 4" and 6" flanged joint
    l. Tighten bolts in proper sequence
    m. Cut, ream, and thread pipe by hand
    n. Cut, ream, and thread pipe with machine
    o. Install fittings on pipe
    p. Install hangers and supports
    q. Assemble victualic pipe and fittings
    r. Install valves on pipe
    s. Construct piping arrangements using a variety of fittings
    t. Use thread lubricants on joints for specific services
    u. Hydrostatically test a pipeline

2. Assemble steel pipe for welding
    a. Calculate the length of pipe required for rolled offsets
    b. What is the center to face length of SR 90's, LR 90's and 45's
    c. Calculate the length of pipe required for 45° welded offsets
    d. Explain how to align large diameter pipe using toggles and wedges
    e. Explain how to align welded fittings to pipe
    f. Align pipe for welding
    g. Align and set-up 90, 45, tee, flanges for welding
    h. Set-up weldolets for welding
    i. Bend pipe using hydraulic bender
    j. Hot bend steel pipe
    k. Pickle steel pipe
    l. Weld pipe using appropriate torch in different positions:
        i. Horizontal rolled
        ii. Horizontal fixed
        iii. Vertical fixed
        iv. Overhead fixed
    m. Cut out and replace a section of pipe

3. Assemble cast iron pipe
   a. List the information required to order pipe and fittings
   b. Explain the methods used to cut cast iron pipe
   c. How is a chaulked joint made in cast iron pipe
   d. Explain how black pipe is galvanized
   e. Cut pipe with instantaneous cutters
   f. Cut cast iron pipe using a machine
   g. Make caulked joints
   h. Make bibby, bi-seal joints
   i. Make mechanical joints
   j. Install hangers and supports

4. Bend pipe
   a. Explain how to bend steel pipe hydraulically
   b. Explain the thermo method of bending steel pipe
   c. Bend pipe using hydraulic benders
   d. Hot bend pipe

5. Maintain piping systems by coding, inspecting, maintaining and repairing
   a. List the common types of valves and their purpose
   b. Describe the different pressures and temperatures to which steel pipes are subjected
   c. Explain hydrostatic testing
   d. Code piping systems to indicate product and direction of flow in system
   e. Repair piping leaks by installing new gaskets, new pipe sections, new pipe fittings and soldering
   f. Repack, grease and adjust expansion joints
   g. Repair and maintain gate, globe, angle check non-return and control valves
   h. Repair and maintain float, bucket, thermostatic impulse and inverted bucket traps
   i. Repair and maintain pipe line filters and strainers
   j. Repair and maintain piping support systems
   k. Replace and test safety and relief valves
   l. Repair and maintain pipe insulation

6. Fabricate and/or install hangers and supports
   a. Explain how sound is isolated from traveling the length of pipe from machinery
   b. Explain how to prepare pipe for Victualic fittings
   c. Make templates
   d. Interpret specification sheets
   e. Install anchoring devices into:
      i. Wooden members
      ii. Gypson and other types of finish wall
      iii. Concrete
      iv. Masonry block and brick
   f. Fabricate hangers and supports for pipe and equipment

g. Install pipe hangers and supports
h. Install equipment hangers and supports
i. Isolate sound and vibration
j. Fabricate one-piece angle, or channel wall brackets
k. Fabricate three-piece angle, or channel wall brackets
l. Fabricate U-bolts
m. Fabricate clevis hangers
n. Fabricate a pipe saddle support and a pipe stanchion saddle

NAME & NUMBER PF1130 - Non-Ferrous Pipe Assembly

DESCRIPTION

This course in non-ferrous piping fundamentals requires the use of tools and equipment, materials and supplies. It involves selecting, measuring, bending, threading, flaring, swaging and compression joints. It includes information on the assembly of different types of pipes and component parts.

MAJOR TOPICS/TASKS

Bend tubing; Describe the assembly of copper and brass pipe; Assemble plastic pipe; Describe the assembly of bitumenized fibre pipe; Assemble fibreglass pipe; Describe types, use and properties of concrete pipe; Describe types, use and properties of vitrified clay pipe; Describe uses and properties of asbestos pipe; Describe the operation of pressure gauges and explain maintenance and repair procedures

PURPOSE / AIMS

1. To develop the skills and knowledge required for assembling piping systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED May 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Bend tubing
   a. Explain what happens to the walls of tubing when bending
   b. Calculate the amount of tubing required to make a 90° bend with a 10cm radius and 2 15cm tangents
   c. Explain the annealing process and its outcome
   d. Explain the thermo process of tube bending
   e. Bend tube using tube benders
   f. Hot bend tubing
   g. Pickle tubing

2. Describe the assembly of copper and brass pipe
   a. Define the properties of copper and its alloys
   b. Explain the process of threading brass pipe
   c. Explain the process of flaring tubing
   d. Explain the process of using compression and swagelok fittings
   e. Explain the process of brazing
   f. Compare silver solder and soft soldering
   g. Explain the solders used in heating and potable water systems
   h. How is T-drilling done on copper tubing

3. Assemble plastic pipe
   a. List the types of plastic pipe
   b. Explain the temperature pressure relationship of plastic pipe
   c. Compare the characteristics of PVC, CPVC and PE
   d. Explain the threading procedure for plastic pipe
   e. List the methods of joining plastic pipe
   f. Describe thermosetting and thermoplastics
   g. Make joints on PVC, ABS, PE, CPVC, and SDR pipe
   h. Dismantle joints on PVC and ABS pipe
   i. Join thermo-plastic pipe by welding
   j. Join plastic pipe by solvent welding
   k. Join plastic pipe with clamps and insert fittings
   l. Thread plastic pipe
   m. Install supports
   n. Install ground plastic pipe
   o. Join plastic pipe with victualic couplings

4. Describe the assembly of bitumenized fibre pipe
   a. Describe types, use and properties of bitumenized fibre pipe
   b. List the steps in joining bitumenized fibre pipe

5. Assemble fibreglass pipe
   a. Describe types, use and properties of fibreglass pipe
   b. Make a tapered fibreglass pipe joint
   c. Join fibreglass pipe with adhesive

d. Construct a butt strap joint
e. Join flanges to pipe

6. Describe types, use and properties of concrete pipe

7. Describe types, use and properties of vitrified clay pipe

8. Describe uses and properties of asbestos pipe

9. Describe the operation of pressure gauges and explain maintenance and repair procedures

NAME & NUMBER PF1100 - Pipe Fabrication (Layout)

DESCRIPTION

This course in piping fundamentals requires the use of tools and equipment, and materials and supplies. It involves using handbooks to perform pipe layout on the pipe, joint preparation, cutting, fitting and tack welding. It includes information and tables on cutbacks, cutlines, angles, angle of cuts, factors and constants.

MAJOR TOPICS/TASKS

Perform pipe layout; Describe fabrication techniques; Fabricate fittings from Sch 40 BI Pipe; Lay out a 60° turn using a 90° stock elbow; Lay out the cut line and fabricate fittings

PURPOSE / AIMS

1. To develop the skills and knowledge required for pipe layout and fabrication with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals
WD1120 - SMAW Fundamentals
WD1210 - OXY-Fuel Cutting and Welding

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED June 1996

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Perform pipe layout
   a. Explain the uses of a wrap around
   b. Explain how to use a contour marker
   c. Explain how to use the centring head
   d. Explain how to use the circle-ellipse projector
   e. Use pipefitters handbooks
   f. Use measuring tools
   g. Use wrap-a-round
   h. Use contour marker
   i. Use centring head
   j. Use Circle-ellipse projector

2. Describe fabrication techniques
   a. Explain the methods used to divide the surface of a pipe into four equal parts
   b. Define angle of cut, factors for angle of cut
   c. Explain how angle of cut is calculated
   d. Explain how to lay out cut lines for 2, 3 & 4 piece turns
   e. Explain how the length of cut pieces are determined
   f. Explain lay out cut lines for mitre turns on large pipe
   g. Which angle of V gives the best results for a weld
   h. List factors which are controlled by properly aligned joints
   i. How large should a tack weld be
   j. State reasons why fittings should be fabricated on the job
   k. State the consideration that should be given to the pipe wall thickness when pipes of equal diameters intersect

3. Fabricate the following fittings from Sch 40 BI Pipe:
   a. 2 pc. 90 degree elbow
   b. 3 pc. 90 degree elbow
   c. 2 pc. 40 degree
   d. branch and header
   e. concentric reducer and eccentric reducer
   f. tees
   g. laterals
   h. offset
   i. flanges
   j. pipe caps.

4. Lay out a 60° turn using a 90° stock elbow

5. Lay out the cut line and fabricate the following:
   a. 3" 70^0 Two Piece turn,
   b. 4" 90^0 Two Piece turn.

c. 2" 90^0 Three Piece - 6" radius.
d. 3" 90○ Multi-Piece - 14" radius.
e. 3" Branch and Header.
f. 2" Lateral Connection
g. 4" 45○ True-Wye
h. 3" x 2" Concentric Reducer

NAME & NUMBER PF1110 - Template Development

DESCRIPTION

This course in piping fundamentals requires the use of tools and equipment, and materials and supplies. It involves lay outs and template development. It includes information on various types of layouts, structural shapes, design and layout of pipe turns, laterals, end caps and special connections non-stock type welded joints.

MAJOR TOPICS/TASKS

Plan and perform layout work; Layout pipe templates; Develop templets

PURPOSE / AIMS

1. To develop the skills and knowledge required for pipe templet development with respect to various codes and standards
2. To develop templet for various changes in size, turn direction, blanking and branching of pipe lines

PREREQUISITES None

COURSE DURATION 90hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Plan and perform layout work
   a. Explain stretchout, pattern, templet
   b. Explain four methods of layout
   c. Explain how to find the length of a cylindrical stretchout

d. Draw parallel lines by using perpendiculars
e. Draw parallel lines by the use of arcs
f. Draw parallel lines by measurements
g. Explain tangent, mitre lines
h. Draw tangents to two equal circles
i. Draw a one-inch corner radius to a 90° corner
j. Compute circumference of circles with given diameters
k. Explain vertex and how angles are measured
l. Explain elements in parallel line development
m. Bisect a line that is 2 1/16" long, using a compass
n. Bisect a 40° angle with a compass
o. Divide a circle into 16 equal parts with a compass
p. Use measuring tools
q. Use layout tools

2. Layout pipe templates
   a. List in order the operations necessary to develop a templet for a three piece turn
   b. Explain two methods of finding the angle of turn when two pipes intersect at an angle
   c. List the materials that can be used to make patterns
   d. How can a stock welded elbow be used for an odd angle turn
   e. Draw a sketch showing the angle of turn and a templet angle of a 78° four-piece turn
   f. What governs the number of degree in the templet angle and how is it calculated
   g. Lay out and develop full, half, and piece patterns
   h. Use patterns for marking pipe fittings

3. Develop templets for the following:
   a. 2 pc. 90 degree elbow
   b. 3 pc. 90 degree elbow
   c. 2 pc. 40 degree
   d. branch and header
   e. concentric reducer and eccentric reducer
   f. orange peel
   g. tees
   h. laterals
   i. offset
   j. flanges
   k. pipe caps.

NAME & NUMBER PF1170 - Pipe Blueprint Reading

DESCRIPTION

This drafting course requires the use of pipe drawings, specifications, bills of materials, drawing instruments and facilities. It involves reading industrial pipe drawings, sketches, flow sheets, spool sheets, plot plans, orthographic pipe projection, isometrics, isometric dimensioning, interpretation of pipe specifications. It includes information on locating specific points using Cartesian coordinates and the compass points and elevations.

MAJOR TOPICS/TASKS

Use graphic symbols for pipe, fittings and valves; Sketch orthographic pipe projections (screwed and welded); Sketch sectional pipe views; Convert pipe isometric to orthographic views; Convert pipe orthographic to isometric views; Convert pipe orthographic to oblique views; Interpret flow diagrams; Read piping drawings; Describe drafting software

PURPOSE / AIMS

1. To develop the skills and knowledge required to read industrial pipe drawings.
2. To develop the skills and knowledge required to convert orthographic pipe drawings to isometrics pipe drawings.
3. To develop the skills and knowledge required to apply the dimensioning systems of Cartesian coordinates, alpha-numeric, compass and elevation to pipe drawings

PREREQUISITES DR1110 - Basic Drawing and Sketching

COURSE DURATION 60hrs

LEARNING RESOURCES

National plumbing code
National Building Code
Manual of Instruction for the Plumbing Trades
New Brunswick Modules
Centennial College Modules
Welding (Pender)
Blueprint Reading for Plumbers
Plumbing Technology

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED May 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Use graphic symbols for pipe, fittings and valves
   a. Draw single line orthographic symbols
   b. Draw double line orthographic symbols
   c. Draw single line isometric symbols
   d. Draw screwed, flanged, welded and soldered symbols on fittings and valves.
   e. Draw instrumentation symbols
   f. Draw hydraulic and pneumatic ANSI symbols

2. Sketch orthographic pipe projections (screwed and welded)
   a. Draw all the standard orthographic pipe views
   b. Explain orthographic pipe projections
   c. Visualize piping arrangement
   d. Select views
   e. Layout sketch
   f. Sketch projection
   g. Dimension sketch
   h. Make notations

3. Sketch sectional pipe views
   a. Define sectional view
   b. Locate section
   c. Select type of view
   d. Determine scale
   e. Sketch view
   f. Dimension sketch
   g. Make notations

4. Convert pipe isometric to orthographic views
   a. Define isometric lines, non-isometric lines, isometric axes,
   b. Visualize the view
   c. Layout the plan view
   d. Draw the north, south, east and west elevation views
   e. Dimension appropriate orthographic views
   f. Make notations

5. Convert pipe orthographic to isometric views
   a. Define the steps to convert single line pipe plan views to isometric
   b. Visualize the view
   c. Layout the orthographic compass
   d. Layout the isometric compass with preferred north
   e. Locate non-isometric line end points
   f. Locate isometric circles and cylinders
   g. Convert view

h. Dimension isometric view
i. Make notations

6. Convert pipe orthographic to oblique views
   a. Explain the difference between isometric and oblique pipe drawings
   b. Visualize the view
   c. Layout the orthographic compass
   d. Layout the oblique compass with required north
   e Locate non-oblique line end points
   f. Locate oblique circles and cylinders
   g. Convert view
   h. Dimension oblique view
   i. Make notations

7. Interpret flow diagrams
   a. Define flow diagrams
   b. Identify systems and equipment
   c. Identify flow line direction and pipe line labels
   d. Read process flow sheets
   e. Read mechanical flow sheets
   f. Read utility flow sheets
   g. Read instrumentation flow sheets

8. Read piping drawings
   a. Explain pipe specifications, revisions
   b. Define abbreviations such as ANSI, ASME, ASTM, BOP, BW, CPLG, CONC, ECC, ELEV, FOB, FOT, RED, SCH, TOS SMLS, ETC.
   c. Explain the difference between pipe line valve symbols and hydraulic valve symbols
   d. Define spools and overall dimensions
   e. List information found on piping plot plans
   f. Define isometric callouts, local notes, general notes
   g. Define a BOM, list what it should contain
   h. Define columns and bays
   i. Explain alpha-numeric coordinates, Northerlies, Cartesian coordinates and elevations.
   j. Explain line numbers, project numbers
   k. Define drawing limits, battery limits
   l. Read plot plans, pipe drawing index, isometric call-outs, pipe line list, piping specialty list, and pipe specification
   m. Read pipe schematic diagrams, flow diagrams, isometric drawings, multiview drawings, sleeve drawings, spool sheets, 3D and isometric modelling.
   n. Compute exact locations using compass points, alpha-numeric coordinates, Cartesian coordinates and elevations
   o. Compose bill of materials

9. Describe drafting software
    a. Define CADD
    b. Define parametric design software

NAME & NUMBER PF2240 - Hot Water Heating Systems

DESCRIPTION

This course in piping systems requires the use of tools and equipment, test equipment and materials and supplies. It involves installing, operating, testing and maintaining hot water heating systems. It includes information on types and operation of hot water heating systems and component parts.

MAJOR TOPICS/TASKS

Describe furnaces and water heaters; Design heating system layout; Service and replace heating system valves; Install and service motorized valves; Install and service circulating pumps; Install and service expansion tanks; Remove air from hydronic systems; Troubleshoot heating systems; Install hot water storage tanks and heaters; Install various types of heating furnaces (steel/cast iron); Install mono-flo and two pipe distribution systems; Replace coils, heaters and hot water storage tanks; Install gravity systems; Install forced flow heating system; Install pumps; Install heat transfer units; Install multi-zone hot water heating systems; Install radiant panel and snow melting systems; Install high temperature hot water systems; Fabricate and install expansion bends and joints; Install and service transfer systems; Maintain plant or building heating systems

PURPOSE / AIMS

1. To develop the skills and knowledge required for installing and maintaining hot water heating systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 105hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED June 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Describe furnaces and water heaters
   a. warm air furnace (oil)
   b. warm air furnace (wood)
   c. warm air furnace (wood & oil)
   d. warm air furnace (electric)
   e. warm air furnace (wood & electric)
   f. hot water furnace (oil)
   g. hot water furnace (wood)
   h. oil fired domestic hot water heater
   i. hot water furnace (electric)
   j. gas heating systems

2. Design heating system layout
   a. Describe heating systems for hot water (wood and oil) and warm air (wood and oil)
   b. Describe the operation and specify the uses of copper pipe for hot water heating systems
   c. Describe three hot water heating systems
   d. Describe single zone and multizone hot water heating systems
   e. Specify materials required for specific hot water heating systems
   f. Interpret symbols used for hot water fittings and pipe work
   g. Design hot water heating systems
   h. Describe the procedure for troubleshooting hot water (wood and oil) and warm air (wood and oil) heating systems

3. Service and replace heating system valves
   a. Describe the operation and specify the use of pressure reducing valves
   b. Describe the operation and specify the use of vacuum valves
   c. Describe the operation and specify the use of flo-control valves
   d. Service and replace pressure reducing valves and safety relief valves:
      i. isolate water pressure problems in heating systems (low and high pressure)
      ii. replace pressure reducing valve
   e. Replace vacuum valves:
      i. select and install vacuum valves
   f. Service flow control valves

4. Install and service motorized valves
   a. Describe the operation and specify the use of motorized valves

b. Determine location and the number of zones for motorized valves
c. Install. test and repair motorized valves in multizone systems:
    i. test and repair switches
    ii. detect and repair leaks

5. Install and service circulating pumps
    a. Replace coupling, seals, shafts, and oil wick
    b. Oil circulator pump and motors

6. Install and service expansion tanks
    a. Install expansion tank
    b. Drain water from expansion tank

7. Remove air from hydronic systems

8. Troubleshoot heating systems
    a. Solve problems with heating systems
    b. Develop and follow troubleshooting procedures

9. Install hot water storage tanks and heaters
    a. Install vertical hot water storage tanks
    b. Install electric hot water heater
    c. Install instantaneous hot water heater in oil furnace
    d. Install side arm heater
    e. Install safety devices

10. Install various types of heating furnaces (steel/cast iron)
    a. Describe the operation and specify the use of expansion tanks
    b. Interpret manufacturer's drawings and specifications
    c. Identify and install types of heating furnaces
    d. Identify and install types of radiators
    e. Identify and install expansion tanks
    f. Identify and install piping and fittings, gauges, valves, and controls
    g. Test system

11. Install mono-flo and two pipe distribution systems
    a. Identify and install mono-flo tees (copper and black iron)
    b. Identify and install mono-flo systems (up-feed and down-feed)
    c. Identify and install trunk system
    d. Identify and install series loop system
    e. Identify and install mono-flo and series system
    f. Identify and install two pipe direct return system
    g. Identify and install two pipe reverse return system
    h. Identify and install balancing valves

12. Replace coils, heaters and hot water storage tanks
    a. Replace coils
    b. Replace heaters
    c. Replace hot water tanks

13. Install gravity systems
    a. Locate radiators above boiler
    b. Pipe system
    c. Install expansion tank
    d. Fill and vent system
    e. Fire system and check circulation

14. Install forced flow heating system
    a. Install series loop, series loop split, direct return and reverse return hot water systems
    b. Install compression or expansion tanks
    c. Make boiler headers
    d. Test complete systems

15. Install pumps:
    a. Describe the operation and specify the use of two types of circulator pumps
    b. Cut gaskets for pump flanges
    c. Cut pipe and install flanges
    d. Mount pipe and line-up flanges
    e. Insert gaskets
    f. Tighten flange bolts
    g. Oil pump
    h. Check direction of flow and rotation

16. Install heat transfer units:
    a. Describe the operation and specify the uses of fin type radiators
    b. Describe the operation and specify the uses of cast iron radiators
    c. Place radiators - remove a section from a cast iron sectional radiator
    d. Install mains
    e. Hook up risers to radiators with radiator valves and union elbow
    f. Install vents at all high points
    g. Fill and vent system
    h. Check for leaks, start up system and check circulation
    i. Install unit heaters:
        i. Locate units
        ii. Secure units
        iii. Install unions, valves, vents and drains
        iv. Clean fan, motor, and heater cores
        v. Drain and flush out heaters
    j. Apply appropriate energy conservation materials and methods

k. Maintain heat transfer equipment
   i. Replace sections of cast iron boilers
   ii. Plug defective tubes
   iii. Repair unit heater cores
   iv. Replace unit heater cores
   v. Troubleshoot heating equipment
   vi. Replace boiler tubes

17. Install multi-zone hot water heating systems
   a. Install common zoned heating and cooling systems
   b. Install a combination of system circuits using pumps and two-way and three-way valves
   c. Install electric zone valves
   d. Install thermostatic control valves
   e. Apply appropriate energy conservation materials and methods

18. Install radiant panel and snow melting systems
   a. Install panel heating
   b. Install control valves
   c. Install heat exchanger
   d. Apply appropriate energy conservation materials and methods

19. Install high temperature hot water systems
   a. Install high temperature hot water boilers and generators
   b. Install high temperature hot water circulating pumps
   c. Install expansion drums
   d. Install high temperature hot water heat exchangers
   e. Apply appropriate energy conservation materials and methods

20. Fabricate and install expansion bends and joints
   a. Measure and prepare pipe for expansion "U" bend
   b. Measure, cut, thread, and assemble pipe and fittings for scissor type expansion joints
   c. Install single sleeve and double sleeve expansion joints
   d. Install bellows type expansion joints

21. Install and service transfer systems for the following equipment
   a. Install mud piping systems
   b. Install desilter, desander, and degasser piping
   c. Install supply-tug cement systems
   d. Install rig flare systems piping
   e. Install tankers inert gas systems

22. Maintain plant or building heating systems
   a. Describe the operation and specify the use of wood fired, oil fired and add-on

hydronic systems

b. Inspect and repair hydronic heating systems - pumps, feeders, heat exchangers and convectors
c. Inspect and repair steam heating systems - valves radiators, traps and piping
d. Inspect and repair unit heaters - louvres, cabinets, fans, traps and coils

23. Calculate heat in BTU's

24. Describe methods of heat transfer
    a. Radiant
    b. Conductive
    c. Convective

25. Install pressure relief valves
    a. Connect pressure gauges and automatic controls
    b. Adjust and check controls

NAME & NUMBER PF1300 - Low Pressure Steam Boiler Systems

DESCRIPTION

This course in low pressure steam boiler systems requires the use of tools and equipment, test equipment and materials and supplies. It involves sizing, installing, operating, testing and maintaining low pressure steam boiler systems. It includes information on operating parameters and types of steam boilers and component parts.

MAJOR TOPICS/TASKS

Perform heat loss calculations; Install low pressure steam units; Assemble cast iron sectional steam boilers; Install low pressure steam systems; Install converters

PURPOSE / AIMS

1. To develop the skills and knowledge required for installing, operation and maintenance of low pressure steam boiler systems with respect to various codes and standards.
2. To practice safety in potentially harmful situations.
3. To develop an appreciation for conversation and environmental issues.

PREREQUISITES PF1160 - Piping Shop Fundamentals
PF1170 - Pipe Blueprint Reading
PF1120 - Ferrous Pipe Assembly

COURSE DURATION 90hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Perform heat loss calculations:
   a. Explain the three different types of steam.
   b. Calculate heat in BTU's required to produce steam from water.
   c. Name the letter designations found in steam tables.
   d. Determine the heat loss from a building of specific size and construction material
   e. Describe methods of heat transfer:
      i. sensible and latent heat
      ii. radiant
      iii. conductive
      iv. convective
   f. Select suitable units for heating requirements

2. Install low pressure steam units:
   a. Describe the operation and specify the advantages and disadvantages of steam oil burning units
   b. Install low pressure steam furnace:
      i. wet base
      ii. dry base

3. Assemble cast iron sectional steam boilers:
   a. Describe the general design of low pressure steam boilers.
   b. Explain the terminology related to the points, construction and usage of low pressure steam boilers.
   c. Describe general piping arrangements for low pressure steam boilers.
   d. Explain the term blowdown in reference to safety valves.
   e. Name three types of flame failure devices used to protect low pressure steam boilers.
   f. State the main purpose of a low water cut-off.
   g. List the standards pertaining to low pressure steam boilers as specified by the provincial Boilers Act and Regulations.
   h. State the reason for installing a blowdown system.
   i. Disassemble and assemble a cast iron sectional steam boiler
      i. identify location of boiler
      ii. inspect foundations
      iii. line up boilers on foundations
   j. Install pressure relief valves:
      i. connect pressure gauges and automatic controls
      ii. adjust and check controls

4. Install low pressure steam systems:
   a. State the pressure limitations used to classify a steam system as low pressure.
   b. Sketch a single-line diagram of a basic steam heating cycle and identify the main components.

c. Describe basic mechanical steam systems.
d. State the main function of a boiler steam trap.
e. Sketch a single-line diagram of a boiler and condensate return trap system with pipe, valves and fittings strategically located.
f. Explain the two pump operating control methods used in condensate pump steam systems.
g. Sketch and describe a basic condensate pump system.
h. Install two-pipe heating systems
i. Install Hartford connectors
j. Install condensate pump systems
k. Install heat transfer units:
    i. identify location and install heat transfer units
    ii. identify location of piping and valves
    iii. measure cut ream and threaded pipe
    iv. install pipe and fittings
    v. identify location and type of hangers and method of attachment
l. Apply appropriate energy conservation materials and methods

5. Install converters:
    a. Install converters:
        i. install piping for steam/hot water converters
        ii. install hydronic accessories
        iii. install trap assemblies
        iv. install vacuum breakers
    b. Repair converters:
        i. disassemble heat exchanger
        ii. repair or replace tube bundle and gaskets
        iii. test bundle for leaks
        iv. assemble heat exchanger

NAME & NUMBER PF1330 - Alternate Heat Generators

DESCRIPTION

This course in heat generation systems requires the use of tools and equipment, and materials and supplies. It involves sizing, installing, maintaining, testing and troubleshooting alternative heat generators. It includes information on operation and types of alternate heat generators and component parts.

MAJOR TOPICS/TASKS

Identify solar heating systems; Install and service electric units; Explain the theory of operation and application of coal burners; Describe the operation and specify the uses of specific types of solid fuel burning units; Describe types of solid fuel feed systems; Install and service wood add-on (warm air); Install and service wood/oil combination (warm air); Install and service wood burning/hot water system; Install and service wood/electric combination units; Service gas fitting systems; Describe appropriate energy conservation materials and methods

PURPOSE / AIMS

1. To develop the skills and knowledge required for installing and maintaining alternate heat generation systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Identify solar heating systems
   a. Describe the operation and specify the uses of passive and active solar heating systems
   b. Install a passive solar heating system
   c. Install an active solar heating system

2. Install and service electric units
   a. Select size and location of electric unit
   b. Install electric unit
   c. Service electric unit

3. Explain the theory of operation and application of coal burners
   a. stokers
   b. pulverized- coal burners
   c. coal/oil and coal/water fuels
   d. retrofitting
   e. fuel handling and storage
   f. emission controls

4. Describe the operation and specify the uses of specific types of solid fuel burning units:
   a. wood/ hot water
   b. wood/ warm air
   c. wood/ radiant space heater
   d. wood/ convective space heater

5. Describe types of solid fuel feed systems:
   a. automated
   b. manual

6. Install and service wood burning/hot water system
   a. Install piping for wood burning hot water system
   b. Connect wiring for hot water system
   c. Service wood burning hot water system
   d. Install flue pipe for wood hot water system

7. Service gas fitting systems
   a. Install and service gas lines:
      i. Install and corrosion-protect gas service piping and valves
      ii. Install gas pipe systems, building lines, branch lines, drop lines, dirt pockets
      iii. Test and purge the system
   b. Install gas meters:
      i. Install various types of gas meters

ii. Read the meters

c. Install gas pressure regulators

d. Install and service gas venting systems:

i. Size vent systems
ii. Install various types of vents
iii. Install draft controls and draft inducers
iv. Apply code requirements

e. Install and service atmospheric burners:
i. Install and light up atmospheric burners
ii. Troubleshoot atmospheric burners

f. Install and service gas controls:
i. Install thermocouple and powerpile
ii. Install automatic pilots and pilotstats
iii. Install central valves (electric and non-electric)
iv. Install automatic ignition systems

g. Install conversion systems:
i. Install upshot conversion burners
ii. Install inshot conversion burners
iii. Install power gas conversion burners
iv. Size the burner input

h. Perform combustion efficiency tests:
i. Set the conversion burner
ii. Perform flue gas tests

8. Describe appropriate energy conservation materials and methods

NAME & NUMBER PF2300 - Industrial Burners

DESCRIPTION

This course in heat generation systems requires the use of tools and equipment, test equipment and materials and supplies. It involves sizing, installing, operating, maintaining, testing and troubleshooting industrial burners. It includes information on types of industrial burner systems and component parts.

MAJOR TOPICS/TASKS

Describe combustion processes; Describe types of fuel delivery systems; Supply heated and conditioned fuel oil to the burners; Supply natural gas to burners; Supply combustion air to the boiler; Supply pulverized coal to burners; Maintain and repair combustion handling equipment

PURPOSE / AIMS

1. To develop the skills and knowledge required for operating and maintaining industrial burners with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Describe combustion processes
   a. Describe types of fuels and their characteristics
   b. Explain the combustion process in terms of boiler firing
   c. Explain fluidized bed combustion

2. Describe types of fuel delivery systems in terms of methods and controls

3. Supply heated and conditioned fuel oil to the burners through operation of fuel, pumping and treating system
   a. Provide constant supply of fuel oil to the storage facility by arranging with supplier
   b. Determine the classification, quantity and quality of fuel oil required
   c. Receive, sample and gauge fuel oil deliveries from supplier
   d. Maintain fuel oil storage facilities
   e. Start, stop and operate fuel oil pumping, heating and treating systems
   f. Maintain fuel oil pumping, heating and treating systems

4. Supply natural gas to burners through regulation system and control valves
   a. Provide constant supply of natural gas to high pressure regulator from suppliers terminal
   b. Ensure that high pressure regulator is functional and capable of reducing incoming high pressure natural gas to intermediate pressure
   c. Ensure that intermediate pressure regulator is functional and capable of reducing and maintaining incoming pressure to a low pressure condition compatible with firing equipment on boiler
   d. Ensure that atmospheric dump valve between both regulators is operational
   e. Check and insures that gas high pressure trip mechanism is operable
   f. Ensure that low gas pressure switch is operable
   g. Test fan interlock or flame scanner to trip main gas valve when flame is lost or combustibles in furnace reach a dangerous level
   h. Ensure that all packing glands, etc., are tight and that no gas leakage is occurring

5. Supply combustion air to the boiler through the operation of fans dampers and controls
   a. Determine quantity, quality and pressure of air required
   b. Provide constant supply of preheated air at required pressure, volume and temperature by manipulation of valves, controls and switches
   c. Start, operate and stop electrically and mechanically driven forced and induced draft fans by manipulation of fans controls and switches
   d. Maintain electrically and mechanically driven forced and induced draft fan systems and air preheaters
   e. Operate flue gas analyzers
   f. Start, operate and stop air preheaters - rotary and tubular

6. Supply pulverized coal to burners through operation of conveyers, hoppers, pulverizers, classifiers and fans
    a. Determine the classification, quality and quantity of coal required
    b. Provide constant supply of coal to the storage facility by arrangement with supplier
    c. Receive, sample and calculate coal deliveries from supplier
    d. Start, operate and stop conveyer, pulverizer, classifier and fan systems by manipulating valves, controls and switches
    e. Maintain conveyer, pulverizer, classifier and fan systems

7. Maintain and repair combustion handling equipment
    a. Inspect and repair fans, louvres, dampers and mechanical linkages
    b. Inspect and repair air filters, heaters and preheaters in combustion air system
    c. Inspect and repair precipitators and dust collectors in boiler flue gas systems
    d. Inspect and repair fans and duct work

NAME & NUMBER PF2230 - Steam Systems

DESCRIPTION

This course in piping systems requires the use of tools and equipment, test instruments and materials and supplies. It involves installing, operating, testing and maintaining steam systems. It includes information on types and operation of steam systems and component parts.

MAJOR TOPICS/TASKS

Install low pressure steam systems; Install high pressure steam systems; Install, inspect, test and repair heat exchangers, pressure vessels and tanks; Install steam tracing lines; Install condensate and feedwater heating components; Install sub-atmospheric and vacuum steam systems; Install and service separators; Repair and replace steam traps; Supply treated and conditioned feed water to boilers through operation of treatment equipment; Conduct tests associated with maintaining feed and boiler water in correct balance; Maintain and repair water treatment systems; Service condensate pumps; Install and service pressure regulating valves; Install and service steam controls; Describe the installation of lift fittings

PURPOSE / AIMS

1. To develop the skills and knowledge required for the installation, operation and maintenance of steam systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1300 - Low Pressure Steam Systems

COURSE DURATION 90hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Install low pressure steam systems
    a. Install two-pipe heating systems
    b. Install Hartford connections
    c. Install condensate pump systems
    d. Install heat transfer units
        i. Identify location and install heat transfer units
        ii. Identify location of piping and valves
        iii. Measure, cut, ream, and thread pipe
        iv. Install pipe and fittings
        v. Identify location and type of hangers and method of attachment
    e. Apply appropriate energy conservation materials and methods

2. Install high pressure steam systems
    a. Install steam main and returns
    b. Install expansion joints
    c. Install pressure reducing stations

3. Install, inspect, test and repair heat exchangers, pressure vessels and tanks
    a. Inspect, test and repair external surfaces
    b. Remove manhole covers, wash out plugs and flanges
    c. Remove, test and clean heat exchanger bundles
    d. Inspect, tests, cleans and repairs internal surfaces of pressure vessels
    e. Install gaskets, covers, coils and flanges
    f. Perform hydrostatic tests on pressure vessels
    g. Install converters
        i. Install piping for steam/hot water converters
        ii. Install hydronic accessories
        iii. Install trap assemblies
        iv. Install vacuum breaker
    h. Repair Converters
        i. Disassemble heat exchanger
        ii. Repair or replace tube bundle and gaskets
        iii. Test bundle for leaks
        iv. Assemble heat exchanger

4. Install steam tracing lines
    a. Steam trace valves and headers
    b. Steam trace instrument controls
    c. Steam trace condensate collectors
    d. Steam trace sight glass, gauges, and B-P cells
    e. Steam trace trays

5. Install condensate and feedwater heating components
   a. Identify boiler feed pump and locate in position
   b. Prepare and install pipe and fittings, brackets and supports where necessary
   c. Operate feed pump
   d. Install de-aerators and piping
   e. Install water softeners and piping
   f. Install trim

6. Install sub-atmospheric and vacuum steam systems
   a. Install differential controllers
   b. Install heat controllers
   c. Install heat balancers
   d. Install vacuum systems

7. Install and service separators
   a. Install moisture separators
   b. Install air separators
   c. Install steam separators

8. Repair and replace steam traps
   a. Describe the basic requirements for all steam traps
   b. Explain the principle by which the thermodynamic steam trap operates
   c. Identify and describe servicing and maintenance procedures for steam traps
   d. Select locations for F & T trap, thermostatic trap, thermodynamic disc, and impulse trap
   e. Test traps for operation
   f. Replace defective parts
   g. Install common traps
   h. Disassemble traps
   i. Assemble traps

9. Supply treated and conditioned feed water to boilers through operation of treatment equipment
   a. Start, stop and operate filtration, clarifier, softener, demineralizer, degasifers, de-aerator heater, evaporator and analyzer systems
   b. Start, test, operate and stop condensate systems
   c. Backwash filtrator, clarifier, demineralizer and softener through the manipulation of valves, pumps and switches
   d. Regenerate, demineralizer softener systems by preparing and introducing chemical solutions
   e. Maintain feed water and condensate systems

10. Conduct tests associated with maintaining feed and boiler water in correct balance
   a. chromate
   b. water hardness

c. suspended solids
d. dissolved oxygen
e. sodium alkalinity
f. acid
g. silica
h. phosphate
i. conductivity
j. carbon dioxide
k. calcium
l. magnesium salt
m. ion
n. dissolved solids
o. turbidity
p. oil tests

11. Maintain and repair water treatment systems
    a. Inspect and repair water softener systems, including multiport valves, strainer, vessels and regenerating equipment
    b. Inspect and repair demineralizer systems, strainers, valves, controls, vessels, and regeneration equipment
    c. Inspect and repair filters, clarifiers and clear wells
    d. Inspect and repair hot and cold process softeners (lime soda) equipment
    e. Inspect and repair chemical additive systems, mix tanks, agitators and metering pumps
    f. Inspect and repair feed water heater systems, de-aerators, closed heaters and open heaters
    g. Inspect and repair condensate return systems, tanks, pumps, polishers and collectors

12. Service condensate pumps
    a. Inspect condensate pumps
    b. Isolate pump from system
    c. Replace seals and gaskets

13. Install and service pressure regulating valves
    a. Check regulating valve for
        i. opening
        ii. fuel pressure "steady"
        iii. cut-off
    b. Install pressure regulating valves
    c. Service pressure regulating valves

14. Install and service steam controls
    a. Describe the operation and specify the use of steam controls
    b. Determine the proper type and location of steam controls

c. Install steam controls
d. Service pressure control
e. Service low water cut-off
    i. Drain system to check the operation of low water cut-off
    ii. Clean low water cut-off
    iii. Replace low water cut-off

15. Describe the installation of lift fittings
    a. Name and describe the system in which lift fittings should only be used
    b. State the recommended height limit for single lift fittings

NAME & NUMBER PF1210 - Piping & Heating Control Systems

DESCRIPTION

This course in piping systems requires the use of tools and equipment, and materials and supplies. It involves installation, operation, testing and maintenance of piping and heating control systems. It includes information on types and operation of control systems and component parts.

MAJOR TOPICS/TASKS

Install and service energy modulating controls; Install and service instrument controls and indicating devices; Inspect and test safety valves; Inspect and test flame scanner; Inspect and test "low water cut out"; Inspect and test operating controls - "high and low operating limit controls"; Operate and maintain control systems

PURPOSE / AIMS

1. To develop the skills and knowledge required for the installation, operation and maintenance of piping and heating control systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1300 - Low Pressure Steam Boiler Systems
PF2240 - Hot Water Heating Systems
PF2230 - Steam Systems

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED June 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Install and service energy modulating controls
   a. Explain the operation of energy modulating controls

2. Install and service instrument controls and indicating devices
   a. Temperature and level controls
   b. Orifice flanges
   c. Transmitters
   d. Pressure indicating devices
   e. Aquastats
   f. Airstats
   g. Thermostats
   h. Protector relays
   i. Control panels
   j. Magic eyes
   k. Limit switches

3. Inspect and test safety valves
   a. Identify types of control valves
   b. Ensure that the testing chains, wires or ropes are in good condition
   c. Ensure that operating pressure in system is approximately three quarters of the popping pressure at which the safety valves are designed to pop normally
   d. Inspect discharge pipes to insure that discharge of escaping steam will not endanger personnel or property
   e. Pull on testing wire of one safety valve enough to actuate the testing lever and lift the disc off the seat so the valve will pop
   f. Allow valve to reseat after short blow
   g. Ensure that valve reseats properly
   h. Ensure that no leaks occurred in discharge pipe
   i. Check safety valve for strain or distortion due to weight and expansion of discharge piping
   j. Repeat operation on other valves

4. Inspect and test flame scanner
   a. Ensure that operation of boiler is normal in all other respects and that a short shutdown will not jeopardize the steam supply
   b. Check voltage indication meter so comparisons can be made before and after the test
   c. Ensure that a method of timing is available so interruption time can be accurately observed
   d. Remove scanner head from sight tube or blocks off sight tube so flame cannot be sensed by the scanner
   e. Begin timing sequence from the instant the scanner head is removed, or sight tube is blocked off, until the fuel shut off device is activated

f. Allow sufficient time to elapse for the lock out switch or alarm or both to be activated
g. Replace scanner to normal operation, resets lock out and allows burner to resume normal operation
h. Check timing sequence with manufacturer's and code requirements

5. Inspect and test "low water cut out"
   a. Ensure that operation of boiler is normal in all other respects and that a short shutdown will not jeopardize the steam supply
   b. Ensure that blowdown lines are clear by opening valves and allowing water to be forced out of discharge pipe
   c. Open blowdown valves enough to allow water level in chamber of control to be lowered below the cut off level
   d. Observe actin of fuel supply cut off device when cot out switch has been activated
   e. Observe operation of alarm when activated
   f. Close blowdown valve and allows water in chamber to return to normal operational level
   g. Test auxiliary low water cut out as above
   h. Allow burner to resume normal operation

6. Inspect and test operating controls - "high and low operating limit controls"
   a. Engage manual control on burner to override the modulating controls
   b. Advance fuel firing rate by hand to raise the normal pressure beyond the usual operating range
   c. Observe boiler pressure until sufficient pressure has been reached to activate the operating limit control, cutting off the fuel supply
   d. Observe and record pressure at which point the actual cut off occurred
   e. Install a temporary wire or uses other means to reactivate operating limit control
   f. Observe that burner starts properly after operating control is reactivated
   g. Allow pressure to continue to raise until it overrides the setting of the hi-limit control
   h. Observe that burner shuts off properly
   i. Remove jumper wire or other apparatus from operating limit control
   j. Allow pressure to drop to normal again
   k. Observe amount of pressure present when the operating limit cuts in the burner
   l. Allow burner to resume normal operation
   m. Record time interval between start and finish of purge operation
   n. Observe operation of fuel cut off devices while performing tests
   o. Observe operation of alarms while performing tests

7. Operate and maintain control systems
   a. Manipulate selector stations manually to position equipment operators
   b. Adjust controller set points manually to affect changes in the controlled medium
   c. Inspect and test control systems by simulating actual load conditions
   d. Operate automatic control systems to affect changes in the controlled medium

e. Operate automatic combustion control systems
f. Operate turbovisory equipment
g. Operate electrical switch gear, panels, voltage regulators and rectifiers
h. Operate computer systems as applied to boilers, power generation and complex heating systems
i. Observe, interpret and analyze readings from charts, digital displays and computer printouts
j. Interface with automatic control systems, pneumatic, electronic and computerized
k. Analyze control system malfunctions and co-ordinates their correction
l. Operate, test and maintain building heat and air conditioning automated control systems

NAME & NUMBER PF2410 - Specialized Piping Systems

DESCRIPTION

This course in piping systems requires the use of tools and equipment, test instruments and materials and supplies. It involves installation, testing and maintenance of specialized piping systems. It includes information on types and operation of specialized piping systems and component parts.

MAJOR TOPICS/TASKS

Install pipe covering; Install and service vacuum systems; Install underground distribution systems; Install equipment for bulk loading station; Install fire extinguishing systems; Install fire lines and fire hose cabinets; Install and maintain swimming pool piping and accessories; Install and maintain lawn sprinkler system; Install food processing systems

PURPOSE / AIMS

1. To develop the skills and knowledge required for the installation and maintenance of specialized piping systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES Pf1160 - Piping Shop Fundamentals

COURSE DURATION 60hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED June 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Install pipe covering
   a. Describe types of pipe covering
   b. Describe types of piping systems with sanitary fittings
   c. Select pipe covering including steam, hot and cold water, and refrigeration process designed covering
   d. Apply appropriate energy conservation materials and methods

2. Install and service vacuum systems
   a. Describe types and explain the operation of vacuum systems
   b. Install power units
   c. Locate and pipe inlet connections
   d. Vent the power units
   e. Test systems

3. Install underground distribution systems
   a. Describe types of underground distribution systems
   b. Shore trenches
   c. Anchor piping
   d. Rod piping

4. Install equipment for bulk loading station
   a. Describe equipment for bulk loading station
   b. Install piping
   c. Install rotary joints
   d. Make and install flex hoses
   e. Install pumps
   f. Install on-ground piping systems
   g. Install preheaters

5. Install fire extinguishing systems
   a. Explain the operation of Halon fire extinguishing systems

6. Install fire lines and fire hose cabinets
   a. Describe types of fire lines and fire hose cabinets
   b. Install fire hose cabinets
   c. Install stand pipes
   d. Test and maintain fire alarm and sprinkler systems

7. Install and maintain swimming pool piping and accessories
   a. Describe swimming pool piping and accessories
   b. Interpret drawings and specifications
   c. Identify and install types of systems
   d. Identify and install piping and fittings

e. Identify and install balancing tanks
f. Clean equipment
g. Identify and install filters
h. Identify and install chlorinators
i. Identify and install circulating systems
j. Identify and install heaters
k. Identify and install automatic controls
l. Service and maintain systems

8. Install and maintain lawn sprinkler system
   a. Explain wet and dry sprinkler systems and wet systems with siamese connections
   b. Describe types and explain the operation of lawn sprinkler systems
   c. Interpret drawings and specifications
   d. Identify and install types of systems
   e. Identify and install spray heads
   f. Identify and install draining points
   g. Identify and install valves
   h. Identify and install chemical fertilizer injectors
   i. Identify and install back siphonage preventer
   j. Service and maintain system

9. Install food processing systems
   a. Describe types and explain the operation of food processing systems
   b. Interpret drawings and specifications
   c. Identify and install types of systems
   d. Identify and install piping and fittings
   e. Identify types and effects of fluids transferred
   f. Test system
   g. Service and maintain system

NAME & NUMBER WA1120 - Fundamentals of Hydraulics & Pneumatics

DESCRIPTION

This course in hydraulics and pneumatics requires the use of basic tools, shop equipment and test equipment. It involves disassembling and reassembling hydraulic and pneumatic systems; and inspecting, testing and repairing/replacing component parts and making adjustments. It includes information on the operation of different types of hydraulic and pneumatic systems and component parts.

MAJOR TOPICS/TASKS

Replace hydraulic filters, strainers and magnetic plugs; Service hydraulic lines, seals and fittings; Service, repair/replace hydraulic pumps and motors; Service hydraulic cylinders and accumulators; Replace hydraulic control valves and seals; Service compressors, safety valves and gauges; Fill and bleed hydraulic system; Repair/replace pneumatic systems; Diagnose hydraulic systems problems; Troubleshoot pneumatic systems; Repair and maintain compressors

PURPOSE / AIMS

1. To develop the skills and knowledge required for maintaining and repairing hydraulic and pneumatic systems
2. To develop the skills to use service information effectively
3. To practice safety in potentially harmful situations
4. To develop an appreciation for environmental protection.

PREREQUISITES PF1160 - Piping Shop Fundamentals
PF1170 - Pipe Blueprint Reading

COURSE DURATION 90hrs

LEARNING RESOURCES

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Replace hydraulic filters, strainers and magnetic plugs
   a. Describe hydraulic reservoirs, strainers, filters (felt, mesh and magnetic types) and magnetic plugs and explain their function
   b. Remove and replace hydraulic filters and magnetic plugs
   c. Service reservoir, pressure/vacuum valve

d. Service components

2. Service hydraulic lines, seals and fittings
   a. Describe construction of lines, seals and fittings
   b. Visually examine tubing run to determine need for repairs
   c. Measure, cut, bend, install and secure tubing or tubing runs
   d. Identify signal lines
   e. Test system for leaks, continuity or blockage
   f. Select tubing and fittings
   g. Make solder or flared connections
   h. Fabricate replacement hose and fittings
   i. Inspect and remove components
   j. Replace components
   k. Secure system while components are out of service
   l. Consult with operator before disconnecting any line

3. Service, repair/replace hydraulic pumps and motors
   a. Describe the operation and construction of hydraulic pumps and circuits
      i. gear
      ii. vane
      iii. rotor
      iv. piston
   b. Describe the operation and construction of hydraulic motors and circuits
   c. Remove, disassemble, clean, inspect, assemble and test pumps
   d. Repair/replace pump
   e. Test pressure and flow of pumps
   f. Remove, repair/replace hydraulic motors

4. Service hydraulic cylinders and accumulators
   a. Describe type and construction of hydraulic cylinders and seals
   b. Describe types and construction of hydraulic accumulators
   c. Operationally check hydraulic cylinder
   d. Remove, repair and/or replace hydraulic cylinder
   e. Adjust cylinder packings
   f. Operationally check, remove, repair and/or replace accumulator
   g. Recharge accumulator

5. Replace hydraulic control valves and seals
   a. Describe types and construction and explain the operation of hydraulic control valves
      i. spool
      ii. make-up
      iii. flow divider
      iv. by-pass
      v. safety devices

vi. non-return

b. Describe type and construction, and explain the operation of control valves
c. Use specified procedures to identify defective components
d. Remove, disassemble, clean, inspect, reassemble and test valves
e. Replace valves and seals

6. Service compressors, safety valves and gauges
   a. Check operating cycle
   b. Inspect, remove, and replace defective components

7. Fill and bleed hydraulic system
   a. Describe the procedure used when filling and bleeding hydraulic systems
      i. Identify and describe open and closed center hydraulic circuits
      ii. Identify and describe open and closed loop hydrostatic drive systems
   b. Drain and flush system
   c. Refill and bleed system

8. Repair/replace pneumatic systems
   a. Explain the principles of hydraulics
   b. Describe type and construction, and explain the operation of reservoirs, separators, filters, and piping
   c. Repair/replace components of air distribution systems and air line controls such as filters, regulators, lubricators, drains, air receivers, and dryers
   d. Repair/replace pneumatic linear actuators
   e. Repair/replace pneumatic motors
   f. Repair/replace pneumatic valves
   g. Maintain repair and adjust portable air tools
   h. Repair/replace air compressors and accessories of various types (reciprocating, screw, lobe, vane, etc.)
   i. Repair/replace piping tubing and associated fittings

9. Diagnose hydraulic systems problems
   a. Inspect system
   b. Operationally check system
   c. Remove and replace filters
   d. Check and adjust oil levels
   e. Test and adjust maximum system pressure
   f. Test and correct pump efficiency
   g. Conduct cylinder drift tests, and correct problems
   h. Conduct cycle tests, and correct problems
   i. Flow-test system, and correct problems

10. Troubleshoot pneumatic systems
    a. Recognize and troubleshoot system malfunctions caused by components of the air distribution systems and air line controls such as filters, regulators, lubricators,

drains, air receivers, and dryers
- b. Troubleshoot pneumatic linear actuator problems
- c. Troubleshoot pneumatic motor problems
- d. Recognize and troubleshoot system malfunctions caused by pneumatic valves
- e. Assist in or troubleshoot air logic control circuits
- f. Assist in or troubleshoot electro-pneumatic control systems
- g. Troubleshoot air compressor problems

11. Repair and maintain compressors
- a. Describe the operating principles of piston air compressors
- b. Describe type and construction, and explain the operation of air compressors
- c. Check pressure output
- d. Replace piston rings (reciprocating) if worn
- e. Clean, reseat or replace valves
- f. Check bearing clearance and replace if wear exceeds specifications
- g. Check and replace, if necessary, any timing gears or chains
- h. Check and machine or replace any main shafts or crankshafts
- i. Hone cylinder bores to remove any ridges or burrs
- j. Replace all gaskets and seals wherever there is a potential leak
- k. Maintain the right type and amount of lubricants
- l. Check relief valves
- m. Clean or replace air and oil filters
- n. Keep intercoolers and aftercoolers free from dirt

NAME & NUMBER RF1100 - Refrigeration Fundamentals

DESCRIPTION

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves testing refrigeration systems for temperature and pressure. It includes information on refrigeration principles, refrigerants, testing, heat loss and gain, insulation and types of systems.

MAJOR TOPICS/TASKS

Apply refrigeration cycle principles; Interpret basic compression refrigeration systems and common applications; Use refrigerants (gases and cylinder); Describe operation of common defrost systems; Use cooling test equipment; Maintain evaporators and low pressure recirculating systems; Specify basic absorption systems; Analyse insulation for selected usage; Calculate heat gain and heat loss; Interpret requirements of system accessory devices on sophisticated commercial systems.

PURPOSE / AIMS

1. To develop the skills and knowledge required for testing refrigeration systems with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES None

COURSE DURATION 90hrs

LEARNING RESOURCES

Modern Refrigeration and Air Conditioning

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Apply refrigeration cycle principles
   a. Describe how a mechanical refrigeration system operates.
   b. Read temperature scales
   c. Read pressure scales
   d. Read temperature - pressure charts
   e. Explain temperature heat diagram

f. Explain pressure - enthalpy diagrams

2. Interpret basic compression refrigeration systems and common applications:
   a. low side float control
   b. high side float control
   c. TEV controlled
   d. automatic expansion valves
   e. capillary control
   f. multiple evaporator system
   g. compound system
   h. cascade system
   i. modulating

3. Use refrigerants (gases and cylinder)
   a. Describe halocarbon and ammonia refrigerants:
      i. types in use
      ii. thermodynamic properties
      iii. physical properties
      iv. enthalpy diagrams
   b. Interpret code and safety requirements pertaining to the use of refrigerants and cylinders
   c. Identify, refill and transfer halocarbons to charging cylinders
   d. Remove refrigerant from system using an approved refrigerant recovery unit

4. Describe operation of common defrost systems:
   a. hot gas
   b. electric

5. Use cooling test equipment
   a. Select air measuring instrument
   b. Select cooling test instrument
   c. Measure temperature, pressure and volume of air
   d. Operate refrigeration diagnostic instruments

6. Maintain evaporators and low pressure recirculating systems
   a. Identify types, uses and explain the operation of evaporators
   b. Maintain evaporator defrosting methods
   c. Maintain suction line accumulators
   d. Maintain recirculating systems
   e. Maintain an intercooler
   f. Operate liquid transfer system

7. Specify basic absorption systems
   a. Describe the operation of a basic absorption system
   b. Draw a basic absorption system

c. Interpret operation of absorption systems

8. Analyse insulation for selected usage
   a. Determine the insulation requirements for low, medium and high temperature rooms

9. Calculate heat gain and heat loss
   a. Plot the relationship between temperature, relative humidity, moisture content and specific volume of air-vapour mixture on the psychometric chart
   b. Determine quantities of heat and methods of heat transfer to raise or lower temperature
   c. Calculate residential and commercial heat gain and loss

10. Interpret requirements of system accessory devices on sophisticated commercial systems.

NAME & NUMBER PF1220 - Pump Installation

DESCRIPTION

This course in piping fundamentals requires the use of tools and equipment, and materials and supplies. It involves selecting, installing, testing and adjusting pumps. It includes information on various types of pumps and component parts.

MAJOR TOPICS/TASKS

Describe various types of pumps and explain their operation; Install and align reciprocating pumps; Install centrifugal pumps; Install and service fuel pumps; Install and service rotary pumps

PURPOSE / AIMS

1. To develop the skills and knowledge required for the installation and maintenance of pumps with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Pocket Manual
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Describe various types of pumps and explain their operation

a. vane
b. radial piston
c. axial piston
d. vacuum
e. gear type
f. screw type
g. metering
h. multi-stage
i. lobe type

2. Install and align reciprocating pumps
   a. Install shallow well domestic water pump system
   b. Install water tank and accessories
   c. Test water pump installation
   d. Repair and reset pressure switch
   e. Repair or replace pressure relief valve
   f. Replace cylinder sleeves
   g. Maintain oil levels as required
   h. Check for bearing wear
   f. Check discharge flow and/or pressure indicating general overall condition of pistons or rings (depending on design)
   g. Check for sticky or worn valves
   h. Check for overload conditions
   i. Check for roughness indicating cavitation

3. Install centrifugal pumps
   a. Install deep well centrifugal pumps
   b. Install deep well double pipe system
   c. Install deep well single pipe system
   d. Repair seal assembly
   e. Repair ejector
   f. Repair pressure regulator
   g. Replace air volume control
   h. Maintain correct oil or grease level
   i. Check bearing clearance
   j. Maintain required flow rate by adjusting RPMs or impeller spacing, where applicable
   k. Check shaft or impeller for wear
   l. Check for leaks

4. Install and service fuel pumps
   a. Describe the operation and specify the use of fuel pumps
   b. Describe the use of fuel pumps for mounting, g.p.h., rotation, speed and one or two pipe systems

5. Install and service rotary pumps
   a. Install and align rotary pumps
   b. Check timing on lobe and screw types
   c. Check for noises caused by wear while affecting timing
   d. Maintain oil levels
   e. Check for sticky or worn valves
   f. Check for overheating
   g. Check for roughness indicating cavitation

6. Install a small submersible pump system

NAME & NUMBER PF2210 - Valves

DESCRIPTION

This course in piping fundamentals requires the use of tools and equipment, and materials and supplies. It involves selecting installing, operating, maintaining, testing and adjusting valves. It includes information on types of valves and component parts.

MAJOR TOPICS/TASKS

Describe the application and operation of valves; Install, inspect and repair valves; Disassemble and assemble a variety of valves ranging in size from 1/4" - 10"; Construct a pressure reducing station and bypass arrangement

PURPOSE / AIMS

1. To develop the skills and knowledge required for installing and maintaining valves with respect to various codes and standards
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

PREREQUISITES PF1160 - Piping Shop Fundamentals

COURSE DURATION 45hrs

LEARNING RESOURCES

New Brunswick Modules
Steamfitter/Pipefitter Manual
Math for Plumbers & Pipefitters
Centennial College Modules
Template Development
Welding (Pender)
Pipe Trades Handbook
Basic Blueprint Reading & Sketching
Rigging Handbook

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED February 1994

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Describe the application and operation of valves
   a. butterfly

b. pinch
c. check
d. globe
e. foot
f. safety
g. pressure reducing
h. relief
i. directional
j. knife
k. gate
l. metering
m. reversing valves

2. Install, inspect, maintain and repair valves
   a. Include the following types
      i. gate valves
      ii. globe valves
      iii. check valves
      iv. safety valves
      v. pressure reducing valves
   b. Determine the operating limitations of valves
   c. Describe the installation procedure for various valves
   d. Describe the maintenance procedure for various valves
   e. Check the condition of seat and disc
   f. Replace bonnet gasket
   g. Lubricate where applicable
   h. Perform hydrostatic pressure test
   i. Check for misalignment and binding
   j. Install and support valve as per drawing
   k. Remove and replace packing around stems of valves

3. Disassemble and assemble a variety of valves ranging in size from 1/4" - 10", including
   a. globe
   b. gate
   c. safety
   d. check valves

4. Construct a pressure reducing station and bypass arrangement to include, two gate valves, globe valve, safety valve, and pressure reducing valve

NAME & NUMBER PF2500 - Cross-Connection Control

DESCRIPTION

This course involves selecting, testing, and troubleshooting various types of back-flow prevention devices. It includes information on code requirements, industry standards and manufacturer's specifications.

MAJOR TOPICS/TASKS

Identify cross-connections and describe cross-connection control systems management; Install back-flow prevention devices; Test back-flow prevention devices; Repair back-flow prevention device

PURPOSE / AIMS

1. To develop the skills and knowledge required to select, install, test and maintain back-flow prevention devices.
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues.

PREREQUISITES None

COURSE DURATION 45 hrs

LEARNING RESOURCES

EVALUATION Theory and Practical Applications Require a Pass Mark of 70%.

DATE DEVELOPED July 1998

COURSE OUTLINE / LEARNING OBJECTIVES:

1. Identify cross-connections and describe cross-connection control systems management
   a. Identify an existing cross-connection.
   b. Recognize a potential cross-connection situation.
   c. Describe the administrative structure necessary to set up and manage an effective cross-connection control system.

2. Install back-flow prevention devices.
   a. Describe cross-connection control and back-flow prevention.
   b. Distinguish between back siphonage and back pressure.
   c. Explain the scientific concepts involved in a back-flow situation.
   d. Describe the functional operation of each back-flow prevention device.
   e. Check direction of flow

f. Locate isolating valve(s)
g. Maintain device supports
h. follow manufacturer's and code requirements

3. Test back-flow prevention devices
   a. Determine when to implement internal isolation, premise isolation, or both.
   b. Explain the importance of proper and regular maintenance and testing.
   c. Describe testing procedures.
   d. Distinguish between the degrees of hazards.
   e. Locate isolating valve(s)
   f. Select test equipment
   g. Conduct test as per manufacturer and code requirements.
   h. Record test results.

4. Repair back-flow prevention device.
   a. Choose the most appropriate method of protecting the potable water system in any given situation.
   b. Evaluate test results
   c. Isolate device
   d. Repair/replace as per code requirements and manufacturers specifications
   e. Retest device
   f. Record test results.

NAME AND NUMBER: Piping and Heating PF 2440

DESCRIPTIVE TITLE: Specialty Piping

DESCRIPTION:

This course in piping fundamentals requires the use of tools and equipment, and materials and supplies. It involves selecting, measuring, cutting, threading, and joint preparation and installation procedures for stainless steel, chromoly and heavy wall pipe.

PREREQUISITES: PF1160 - Piping Shop Fundamentals
PF1130 - Non-Ferrous Pipe Assembly
PF1120 - Ferrous Pipe Assembly
WD1210 - Oxy-Fuel Cutting & Welding
WD1120 - SMAW Fundamentals
TS1300 - Rigging
PF1110 - Template Development
PF1100 - Pipe Fabrication Layout

CO-REQUISITES: None

CREDITS VALUE: 2 (45 hours)

TEXT BOOK(S)/SOFTWARE USED BY LEAD INSTITUTION:
New Brunswick Steamfitter/ Pipefitter modules
- Industrial Piping, by Charles J Littlejohn
- Piping Handbook, by R. C, King, et la
- Welding, by R. T. Miller
- IPT Pipe trades Handbook

COURSE AIMS:

1. To develop the skills and knowledge required for assembling stainless steel and chromoly and heavy wall piping systems with respect to various codes and standards
2. To practice safety in potentially harmful situations.
3. To develop an appreciation for conversation and environmental issues.

COURSE OBJECTIVES (KNOWLEDGE):

1. Fabricate changes of direction with stainless steel, chromoly and heavy wall piping
2. Assemble stainless steel, chromoly and heavy wall pipe fittings
3. Practice safety while using abrasive high speed cut-off tools.

MAJOR TASKS/SUBTASKS(SKILLS):
1. Describe the application for stainless steel, including types 304, 308, 316, 317 and SMO

2. Describe methods of cutting stainless steel, including types 304, 308, 316, 317 and SMO
   a. power or flux cutting
   b. plasma arc torch cutting
   c. grinding and cut-off tools (abrasive)
   d. manual and power cut-off (saw blades)

3. Describe the procedure for joining stainless steel by welding
   a. electrode selection
   b. criteria for good welds
   c. metal arc welding
   d. gas or oxy- acetylene
   e. tig or tungsten inert gas welding
   f. mig or gas metal arc welding
   g. resistance/spot welding
   h. butt welding

4. Tapp and thread stainless steel
   a. tapping procedures
   b. threading procedures

5. Solder stainless steel
   a. soldering procedures
   b. silver soldering (brazing) procedures

6. Drill stainless steel
   a. drilling procedures
   b. reaming procedures

7. Heat treatment of stainless steel
   a. basic operations
   b. annealing

8. Removal of scale and pickling
   a. procedures involved
   b. degreasing
   c. removing protective coating

9. Purging with gas and damming
   a. shielding gases
   b. gas backing
   c. typical procedures
   d. disposal rice paper dams
   e. purge dam construction

10. Describe the types of stainless steel pipe and tubing

a. Austenitic stainless
b. martensitic stainless
c. ferritic chromium stainless steels
d. cold finishing pipe and tubing
e. packaging, shapes
f. characteristics and operations
g. specifications

11. Describe methods of joining stainless steel
    a. socket weld fittings
    b. butt weld
    c. threaded
    d. Chromoly and heavy wall pipe

12. Describe low alloy steel
    a. types
    b. composition
    c. application

13. Describe chrome and nickel steels
    a. types
    b. composition
    c. applications

14. Heat treatment and stress relieving
    a. purpose
    b. preheat and postheat methods

15. Describe porosity in welds
    a. causes
    b. remedies

16. Describe welding equipment and supplies

17. Describe methods of joint preparation
    a. sharp vee joint
    b. U groove joint
    c. consumable insert joint
    d. J joint
    e. compound bevel

EVALUATION:

Written reports and/or tests
Competence in simulated work and/or experiential endorsements

LEAD INSTITUTION:

DEVELOPMENT HISTORY:

Date developed: May 1999

REQUIRED RELATED COURSES

COURSE NAME & NUMBER: Workplace Correspondence CM2150

DESCRIPTIVE TITLE: Workplace Correspondence

CALENDAR TITLE:

1.0 Type and Purpose Communications 2150 gives students the opportunity to study the principles of effective writing. Applications include letters, memos, and short report writing.

2.0 Major Topics Review of Sentence and Paragraph Construction; Business Correspondence; Informal Report; Job Search Techniques.

PREREQUISITES: Nil

CO-REQUISITES: Nil

COURSE DURATION 45hrs

SUGGESTED TEXT/ LEARNING RESOURCES:

Textbooks: Business English and Communications, Fourth Canadian Edition, Clark, Zimmer, et al., McGraw-Hill Ryerson, 1990

Student Projects and Activities for Business English and Communications,

Fourth Canadian Edition, Clark, et al., McGraw-Hill, 1990

Effective Business Writing, Jennifer MacLennon

Simon and Shuster Handbook for Writers, Second Edition, Troyka Lynn Quitman, Prentice Hall

College English Communication, Third Canadian Edition, Stewart, Zimmer, et al., McGraw-Hill Ryerson Limited, 1989

Business and Administrative Communication, Second Edition, Kitty O. Locker. IRWIN, 1991

References: Pittman Office Handbook, Smith/Hay-Ellis

The Gregg Reference Manual, Fourth Canadian Edition, Sabin/O'Neill

McGraw Hill Handbook

Other Resources: Business Letter Business (Video), Video Arts

Guest Speakers
Sell Yourself (Video)

COURSE AIMS:

1. To help students understand the importance of well-developed writing skills in business and in career development.
2. To help students understand the purpose of the various types of business correspondence.
3. To examine the principles of effective business writing.
4. To examine the standard formats for letters and memos.
5. To provide opportunities for students to practice writing effective letters and memos.
6. To examine the fundamentals of informal reports and the report writing procedure.
7. To provide an opportunity for students to produce and informal report.

MAJOR TOPICS/TASKS:

1.0 Review of Sentence and Paragraph Construction
2.0 Business Correspondence
3.0 Informal Report/Present Orally

COURSE OUTLINE:

1.0 Review of Sentence and Paragraph Construction

- 1.1 Examining and applying principles of sentence construction
- 1.2 Examining and applying principles of paragraph construction

2.0 Business Correspondence

- 2.1 Examining the value of well-developed business writing skills
- 2.2 Examining principles of effective business writing
- 2.3 Examining business letters and memos

3.0 Informal Report

3.1 Examining the fundamentals of informal business reports

3.2 Applying informal report writing skills

LEARNING OBJECTIVES:

1.0 Review of Sentences and Paragraph Construction

1.1.1 Define a sentence and review the four types.
1.1.2 Identify the essential parts of a sentence, particularly subject and predicate, direct and indirect object.
1.1.3 Differentiate among phrases, clauses, and sentences.
1.1.4 Explore the major concepts related to subject-verb agreement.
1.1.5 Apply rules and principles for writing clear, concise, complete sentences which adhere to the conventions of grammar, punctuation, and mechanics.

1.2 Examine and Apply Principles of paragraph Construction

1.2.1 Discuss the basic purposes for writing.
1.2.2 Define a paragraph and describe the major characteristics of an effective paragraph.
1.2.3 Write well-developed, coherent, unified paragraphs which illustrate the following: A variety of sentence arrangements; conciseness and clarity; and adherence to correct and appropriate sentence structure, grammar, punctuation, and mechanics.

2.0 Business Correspondence

2.1 Examine the Value of Business Writing Skills

2.1.1 Discuss the importance of effective writing skills in business
2.1.2 Discuss the value of well-developed writing skills to career success

2.2 Examine Principles of Effective Business Writing

2.2.1 Discuss the rationale and techniques for fostering goodwill in business communication, regardless of the circumstances
2.2.2 Review the importance of revising and proofreading writing

2.3 Examine Business Letters and Memos

2.3.1 Differentiate between letter and memo applications in the workplace
2.3.2 Identify the parts of a business letter and memo
2.3.3 Explore the standard formats for business letters and memos
2.3.4 Examine guidelines for writing an acceptable letter and memo which convey: acknowledgment, routine request, routine response, complaint, refusal, and persuasive request, for three of the six types listed
2.3.5 Examine samples of well-written and poorly written letters and memos

3.0 Informal Report

3.1 Examine the Fundamentals of Informal Business Reports

3.1.1 Identify the purpose of the informal report
3.1.2 Identify the parts and formats of an informal report
3.1.3 Identify methods of information gathering

3.2 Apply Informal Report Writing Skills and Oral Reporting Skills

3.2.1 Gather pertinent information
3.2.2 Organize information into an appropriate outline
3.2.3 Draft a five minute informal report
3.2.4 Edit, proofread, and revise the draft to create an effective informal report and present orally using visual aids.

RECOMMENDED EVALUATION:

Required Pass Mark 70%

DEVELOPMENT HISTORY:

Date Developed:
Date Revised: 1999 05 03

NAME AND NUMBER: Customer Service MR1210

DESCRIPTIVE TITLE: Customer Service

SUMMARY DESCRIPTION:

This course focuses on the role of providing quality customer service. It is important to have a positive attitude and the necessary skills to effectively listen and interpret customer concerns about a product, resolve customer problems, and determine customer wants and needs. Students will be able to use the skills and knowledge gained in this course to effectively provide a consistently high level of service to the customer.

PREREQUISITES: None

CO-REQUISITES: None

SUGGESTED DURATION: 30 hrs

EVALUATION: Theory and Practical Applications Require a Pass Mark of 70%.

COURSE AIMS:

1. To know and understand quality customer service

2. To know why quality service is important

3. To know and understand the relationship between "service" and "sales"

4. To understand the importance of and to demonstrate a positive attitude

5. To recognize and demonstrate handling of customer complaints

COURSE OBJECTIVES (KNOWLEDGE):

1. Providing Quality Service

- Define quality service
- List the types of quality service
- Define Service vs. Sales or Selling
- Explain why quality service is important
- Identify the various types of customers
- Define customer loyalty

2. Determining Customers Wants and Needs

- List four levels of customer needs
- Identify important customer wants and needs
- Identify ways to ensure repeat business

3. Demonstrating a Positive Attitude

- List the characteristics of a positive attitude
- Explain why it is important to have a positive attitude
- List ways that a positive attitude can improve a customer's satisfaction
- Define perception
- Explain how perception can alter us and customers
- Understand how to deal with perception

4. Effectively Communicating with customers

- Describe the main elements in the communication process
- Identify some barriers to effective communication
- Define body language
- Explain how body language would affect customers
- Determine why body language is important
- Define active listening and state why it is important
- Describe the four components of active living
- Contrast good and bad listeners
- List and discuss the steps of the listening process

5. Effectively using Questioning Techniques

- List questioning techniques
- Write two example of an open question
- Perform a questioning and listening role play

6. Using the Telephone Effectively

- List the qualities of a professional telephone voice
- Explain why telephone skills are important
- Demonstrate effective telephone skills

7. Asserting Oneself: Handling Complaints and Resolving Conflict

- Define assertiveness
- Define communication behaviors
- Relate assertions to effective communication
- Practice being assertive
- Understand the process of assertive guidelines for action
- Practice giving an assertive greeting

- Acknowledge multiple customers

8. Dealing with Difficult Customers

- Describe how you would deal with anger
- Complete a guide to controlling feelings
- Determine how you would feel dealing with an upset customer
- Suggest some techniques that might control your own feelings
- Understand leadership styles and the nature of organizations
- List ways to dealing with conflict / customer criticism
- Be aware of certain guidelines when confronting customers
- List ways of preventing unnecessary conflict with customers
- Review current skills and knowledge of customer service
- Develop a customer satisfaction improvement plan

NAME AND NUMBER: QA/QC SP2330

DESCRIPTIVE TITLE: Quality Assurance / Quality Control

DESCRIPTION:

This general studies course requires the use of basic tools and equipment and materials and supplies. It requires controlling drawings and specifications and/or calibrating measuring devices in applicable occupations.It involves interpreting standards, controlling the acceptance of raw materials, controlling quality variables and documenting the process. It includes information on quality concepts, codes and standards, documentation, communications, human resources, company structure and policy, teamwork and responsibilities.

PREREQUISITES: None

CO-REQUISITES: None

SUGGESTED DURATION: 30 Hrs

COURSE AIMS:

1. To develop the skills and knowledge required to apply quality assurance/quality control procedures

2. To develop an awareness of quality management principles and processes

COURSE OBJECTIVES (KNOWLEDGE):

1. Describe the reasons for quality assurance and quality plans.

2. Explain the relationship between quality assurance and quality control.

3. Describe quality control procedures as applied to the production and checking of engineering drawings in applicable occupations.

4. Describe quality control procedures as applied to the acceptance and checking of raw materials.

5. Explain the role of communications in quality management.

6. Explain why it is important for all employees to understand the structure of the company and its production processes.

7. Explain how human resource effectiveness is maximized in a quality managed organization.

8. Explain the role of company policy in quality management.

9. Explain the purpose of codes and standards.

10. Explain the concepts of quality

    a. cost of quality
    b. measurement of quality
    c. quality control and quality assurance
    d. elements of quality
    e. elements of the quality audit
    f. quality standards
    g. role expectations and responsibilities

11. Explain the structure of quality assurance and quality control

    a. Define quality assurance, quality control and documentation terminology
    b. Describe organizational charts
    c. List the elements of a quality assurance system
    d. Explain the purpose of the quality assurance manual
    e. Describe quality assurance procedures
    f. Explain the key functions and responsibilities of personnel

12. Complete quality assurance/quality control documentation

    a. Describe methods of recording reports in industry
    b. Describe procedures of traceability (manual and computer-based recording)
    c. Identify needs for quality control procedures

MAJOR TASKS / SUBTASKS (SKILLS):

1. Apply quality control to projects

    a. Follow QA/QC procedures for drawings, plans and specifications in applicable occupations.
    b. Calibrate measuring instruments and devices in applicable occupations.
    c. Interpret required standards
    d. Follow QA/QC procedures for accepting raw materials
    e. Carry out the project
    f. Control the quality elements (variables)
    g. Complete QA/QC reports

EVALUATION:

Pass Mark Required 70%

DEVELOPMENT HISTORY:

Date Developed: February 1994
Date Revised: April, 1999

COURSE NAME & NUMBER: Introduction to Computers MC1050

DESCRIPTIVE TITLE: Introduction to Computers

CALENDAR ENTRY:

Type and Purpose This course is designed to give the student an introduction to computer systems. Particular emphasis is given to word processing, spreadsheet, e-mail and the Internet.

Major Topics Microcomputer System Hardware and Software Components; Word Processing; Electronic Spreadsheets; Electronic Mail and the Internet.

PRE-REQUISITES: Nil

CO-REQUISITES: Nil

SUGGESTED DURATION: 30 hours

SUGGESTED TEXT/

LEARNING RESOURCES:

Textbook(s):

References:

Other Resources:

COURSE AIMS:

1. To provide students with a introduction to computer systems and their operation.

2. To introduce students to popular software packages, their applications and future trends in computer applications.

MAJOR TOPICS:

1. Microcomputer System Hardware and Software Components
2. Word Processing
3. Spreadsheet
4. E-Mail and the Internet

COURSE OUTLINE:

1.0 Microcomputer System Hardware and Software Components

1.1 Microcomputer Hardware

1.1.1 System Components
1.1.2 Function of each Component

1.2 Microcomputer Software

1.2.1 Software Definition and Types

1.2.2 System Software (Windows 95)

1.2.3 File Management Commands (Windows 95)

2. Word Processing

2.1 Keyboarding Techniques
2.2 Word Processing

2.2.1 Understanding Word Processing
2.2.2 Create a Document
2.2.3 Save, Open and Edit a Document
2.2.4 Edit a Document: Cut and Paste
2.2.5 Understand Hidden codes.
2.2.6 The Select Feature (Block)
2.2.7 Change Layout Format
2.2.8 Change Text Attributes
2.2.9 Use Auxiliary Tools
2.2.10 Select the Print Feature (number of copies and current document)

3. Electronic Spreadsheet

3.1 Spreadsheet Basics
3.2 Operate Menus
3.3 Create a Worksheet
3.4 Use Ranges
3.5 Print a Worksheet
3.6 Edit a worksheet

4. Electronic Mail and the Internet

4.1 Electronic Mail
4.2 The Internet

Learning Objectives:

1. Microcomputer System Hardware and Software Components

1.1 Microcomputer Hardware

1.1.1 System Components

1.1.1.1 Identify major components of a computer system.

1.1.2 Function of each Component

1.1.2.1 Describe the function of the microprocessor.
1.1.2.2 Describe and give examples of I/O DEVICES.
1.1.2.3 Describe primary storage (RAM, ROM, Cache).
1.1.2.4 Define bit, byte, code and the prefixes k.m. and g.
1.1.2.5 Describe secondary storage (diskettes and hard disks, CD ROMS, Zip Drives etc).
1.1.2.6 Describe how to care for a computer and its accessories.

1.2 Microcomputer Software

1.2.1 Software Definition and Types

1.2.1.1 Define software.
1.2.1.2 Describe, operational and application software used in this course.
1.2.1.3 Define file and give the rules for filenames and file extensions..

1.2.2 System Software (Windows 95)

1.2.2.1 Getting Started with Windows
1.2.2.2 Start and quit a Program
1.2.2.3 Get Help
1.2.2.4 Locate a specific file using the **find** function of Win95
1.2.2.5 Changing system settings:wall paper, screen saver, screen resolution, background.
1.2.2.6 Starting a program by using the Run Command
1.2.2.7 Shutting down your computer

1.2.3 File Management Commands (Windows 95)

1.2.3.1 View directory structure and folder content
1.2.3.2 Organizing files and folders

1.2.3.3 Copy, delete, and move files and folders
1.2.3.4 Create folders
1.2.3.5 Maximize and minimize a window
1.2.3.6 Print directory/folder content
1.2.3.7 Describe the Windows 95 taskbar

2. Word Processing

2.1 Keyboarding Techniques

2.1.1 Identify and locate alphabetic and numeric keys
2.1.2 Identify and locate function keys: special keys, home keys, page up key, page down key, numeric key pad, shift keys, punctuation keys, tab key

2.2 Word Processing

2.2.1 Understanding word processing

2.2.1.1 The Windows Component
2.2.1.2 The Menu Bar
2.2.1.3 Menu Indicators
2.2.1.4 The Document Window
2.2.1.5 The Status Bar
2.2.1.6 The Help Feature
2.2.1.7 Insertion Point Movements

2.2.2 Create a document

2.2.2.1 Change the Display
2.2.2.2 The Enter Key
2.2.2.3 Enter Text

2.2.3 Save, Open and Exit a document.

2.2.3.1 Save a document
2.2.3.2 Close a document.
2.2.3.3 Start a new document Window
2.2.3.4 Open a document
2.2.3.5 Exit Word Processor

2.2.4 Edit a Document

2.2.4.1 Add New Text
2.2.4.2 Delete text

2.2.4.3 Basic Format Enhancement (split and join paragraphs, insert text)

2.2.5 Understand Hidden Codes

2.2.5.1 Display Hidden Codes
2.2.5.2 Delete Text Enhancements

2.2.6 The Select Feature

2.2.6.1 Identify a Selection
2.2.6.2 Move a Selection
2.2.6.3 Copy a Selection
2.2.6.4 Delete a Selection
2.2.6.5 Select Enhancements
2.2.6.6 Save a Selection
2.2.6.7 Retrieve a Selection

2.2.7 Change Layout Format

2.2.7.1 Change layout format: (margins, spacing, alignment, paragraph indent, tabs, line spacing, page numbering)

2.2.8 Change Text Attributes

2.2.8.1 Change text attributes: (bold, underline, font, etc.)

2.2.9 Use Auxiliary Tools

2.2.9.1 Spell Check

2.2.10 Select the Print Feature

2.2.10.1 Select the Print Feature: (i.e; number of copies and current document)
2.2.10.2 Identify various options in print screen dialogue box

3. Electronic Spreadsheet

3.1 Spreadsheet Basics

3.1.1 The Worksheet Window

3.2 Operates Menus

3.2.1 Use a Menu Bar

3.2.2 Use a Control Menu
3.2.3 Use a Shortcut Menu
3.2.4 Save, Retrieve form Menus

3.3 Create a Worksheet
3.3.1 Enter Constant Values and Formulas
3.3.2 Use the Recalculation Feature
3.3.3 Use Cell References (relative and absolute references)

3.4 Use Ranges

3.4.1 Type a Range for a Function
3.4.2 Point to a Range for a Function
3.4.3 Select a Range for Toolbar and Menu Commands

3.5 Print a Worksheet
3.5.1 Print to the Screen
3.5.2 Print to the Printer
3.5.3 Print a Selected Range

3.6 Edit a Worksheet
3.6.1 Replace Cell Contents
3.6.2 Insert and Delete Rows and Columns
3.6.3 Change Cell Formats
3.6.4 Change Cell Alignments
3.6.5 Change Column Width
3.6.6 Copy and Move Cells

4. Electronic Mail and the Internet

4.1 Electronic Mail

4.1.1 Compose and send an e-mail message
4.1.2 Retrieve an e-mail attachments
4.1.3 Send an e-mail message with attachments
4.1.4 Retrieve and save e-mail attachments
4.1.3 Print an e-mail message
4.1.4 Delete an e-mail message

4.2 The Internet

4.2.1 Overview of the World Wide Web
4.2.2 Accessing Web sites
4.2.3 Internet Web Browsers
4.2.4 Internet Search Engines

4.2.5 Searching Techniques

STUDENT EVALUATION:

Required Pass Mark 70%

DEVELOPMENT HISTORY:

Date Designed	**1998**
Date Revised	**1999**

NAME AND NUMBER: Workplace Skills SD 1700

DESCRIPTIVE TITLE: Workplace Skills

DESCRIPTION:

This course involves participating in meetings, doing safety inspections, completing employment insurance forms, writing letters of employment insurance appeal, and filing a human rights complaint. Includes information on formal meetings, unions, worker's compensation, employment insurance regulations, worker's rights and human rights.

PREREQUISITES: None

CO-REQUISITES: None

SUGGESTED DURATION: 30 Hrs

COURSE AIMS:

1. Participate in meetings (conduct meetings).
2. Be aware of union procedures.
3. Be aware of workers' compensation regulations.
4. Be aware of occupational health and safety regulations.
5. Be aware of employment insurance regulations
6. Be aware of workers' rights.
7. Be aware of human rights

COURSE OBJECTIVES (KNOWLEDGE):

1. Meetings
   a. Explain preparation requirements prior to conducting a meeting
   b. Explain the procedures for conducting a meeting.
   c. Explain participation in meetings.
   d. Explain the purpose of motions.
   e. Explain the procedure to delay discussion of motions.
   f. Explain how to amend and vote upon a motion.

2. Unions
   a. Why do unions exist?

b. Give a concise description of the history of Canadian labour.
c. How do unions work?
d. Explain labour's structure.
e. Describe labour's social objectives.
f. Describe the relationship between Canadian labour and the workers.
g. Describe the involvement of women in unions.

3. Worker's Compensation
   a. Describe the aims, objectives, benefits and regulations of the Workers Compensation Board.
   b. Explain the internal review process.

4. Occupational Health and Safety
   a. Describe the rules and regulations directly related to your occupation.

5. Employment Insurance Regulations
   a. Explain employment insurance regulations
   b. Describe how to apply for employment insurance.
   c. Explain the appeal process.

6. Worker's Rights
   a. Define labour standards.
   b. Explain the purpose of the Labour Standards Act.
   c. List regulations pertaining to:
      i. Hours of work.
      ii. Minimum wage.
      iii. Employment of children.
      iv. Vacation pay

7. Human Rights
   a. Describe what information cannot be included on an application.
   b. Describe what information cannot be included in an interview
   c. Why is there a Human Rights Code?
   d. Define sexual harassment.

MAJOR TASKS / SUBTASKS (SKILLS):

1. Participate in meetings.
   a. Follow the form of getting a motion on the floor
   b. Discuss a motion
   c. Amend a motion
   d. Vote on a motion.

2. Complete a safety inspection of your shop.

3. Complete an employment insurance application form.

4. Write a letter of appeal.

5. Analyze a documented case of a human rights complaint with special emphasis on the application form, time-frame, documentation needed, and legal advice available.

Evaluation:

Required Pass Mark 70%

Development History:

Date Developed:
Date Revised: April, 1999

NAME AND NUMBER: Job Search Techniques SD 1710

DESCRIPTIVE TITLE: Job Search Techniques

PREREQUISITES: None

CO-REQUISITES: None

SUGGESTED DURATION: 15 hrs.

EVALUATION: Theory and Practical Applications Require a Pass Mark of 70%.

COURSE OBJECTIVES (KNOWLEDGE):

1. Examine and Demonstrate Elements of Effective Job Search Techniques

- Identify and examine employment trends and opportunities
- Identify sources that can lead to employment
- Discuss the importance of fitting qualifications to job requirements
- Discuss and demonstrate consideration in completing job application forms
- Establish the aim/purpose of a resume
- Explore characteristics of effective resumes, types of resumes, and principles of resume format
- Explore characteristics of and write an effective cover letter
- Explore, and participate in a role play of a typical job interview with commonly asked questions and demonstrate proper conduct
- Explore other employment related correspondence
- Explore the job market to identify employability skills expected by employer
- Conduct a self-analysis and compare with general employer expectations

DEVELOPMENT HISTORY:

Date Developed:
Date Revised: 1999 05 03

NAME AND NUMBER: Entrepreneurial Awareness SD 1720

DESCRIPTIVE TITLE: Entrepreneurial Awareness

PREREQUISITES: None

CO-REQUISITES: None

SUGGESTED DURATION: 15 hrs

EVALUATION: Theory and Practical Applications Require a Pass Mark of 70%.

COURSE OBJECTIVES (KNOWLEDGE):

1. Explore Self-Employment: An Alternative to Employment

- Identify the advantages and disadvantages of self-employment vs. regular employment
- Differentiate between an entrepreneur and a small business owner
- Evaluate present ideas about being in business

2. Explore the Characteristic of Entrepreneurs

- Identify characteristics common to entrepreneurs
- Relate their own personal characteristics with those of entrepreneurs.
- Evaluate their present ideas about business people

3. Identifying Business Opportunities

- Distinguish between an opportunity and an idea.
- List existing traditional and innovative business ventures in the region.
- Explain the general parameters between which business ventures should fit.
- Summarize the role of such agencies Regional Economic Development Boards, Business Development Corporations, etc.
- Identify potential business opportunities within the region.

4. Demystifying the Entrepreneurial Process.

- Explain the entrepreneurial process
- Describe the purpose of a business plan
- Identify the main ingredients of a business plan
- Summarize the role of such agencies as BDC's, ACOA, Women's Enterprise Bureau etc.
- List other agencies where assistance - financial and otherwise - is available to those interested in starting a business venture.

REQUIRED WORK EXPERIENCES

National Red Seal Certification requires that all Apprentices obtain appropriate industry based work experiences. The required work experiences identified in this section are written in the broadest terms so as to ensure the apprentices receive experiences in each of the required areas and to ensure that employers have a degree of flexibility in applying the terms and conditions implicit in a Contract of Apprenticeship. What is important is that both the apprentice and the employer understand the obligations laid out in this plan of training which is designed to ensure that at the completion of both the technical training and the required hours of work experience the apprentice has both the knowledge and the skills necessary to successfully complete the Red Seal Examination.

- selecting, measuring, bending, threading, flaring, swaging compression joints and in the assembly of various types of pipes and component parts

- template development, joint development, fitting and cutting including various structural shapes, tack welding, welded fittings, bending and threading pipe.

- sizing, installing, operating, testing and maintaining a variety of low pressure hot water and steam boilers

- selecting, installing, operating, maintaining, testing, and adjusting various types of valves and component parts

- selecting, installing, testing, and adjusting various types of pumps and component parts

- installing, operating, maintaining, various types of piping and heating control systems and component parts

- installing, operating, testing, maintaining various types of hot water heating systems and component parts

- sizing, installing, operating, maintaining, testing, and troubleshooting various types of industrial burner systems and component parts

- installing, operating, testing and maintaining various types of steam systems and component parts

- installing, maintaining, testing, and troubleshooting alternative heat generators

- installing, testing, maintaining, various types of specialized piping systems and component parts.