

**A PLAN OF TRAINING**  
**FOR**  
**REF. & AIR COND. MECHANIC**  
**OCCUPATION**

**Approved by**  
**Provincial Apprenticeship 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 journey person 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.

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Chair, Provincial Apprenticeship Board

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Minister of 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 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 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 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

<b>7200 Hour Programs</b>	<b>Requirements for Progression</b>	<b>Progress To</b>
First Year Apprentice	25% of Course Credit Hours, <b>Plus</b> relevant work experience totaling 1800 hours	Second Year
Second Year Apprentice	50% of Course Credit Hours, <b>Plus</b> relevant work experience totaling 3600 hours	Third Year
Third Year Apprentice	75% of Course Credit Hours, <b>Plus</b> relevant work experience totaling 5400 hours	Fourth Year
Fourth Year Apprentice	100% of Course Credit Hours, <b>Plus</b> completion and sign-off of workplace skills required for certification totaling 7200 hours	Write Certification Examination
<b>5400/4800 Hour Programs</b>		
First Year Apprentice	33% of Course Credit Hours, <b>Plus</b> relevant work experience totaling 1800/1600 hours	Second Year
Second Year Apprentice	66% of Course Credit Hours, <b>Plus</b> relevant work experience totaling 3600/3200 hours	Third Year
Third Year Apprentice	100% of Course Credit Hours, <b>Plus</b> completion and sign-off of workplace skills required for certification totaling 5400/4800 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:

<b>Program Duration</b>	<b>Wage Rates</b>		<b>Comments</b>
<b>7200 Hours</b>	1 <sup>st</sup> Year	55%	These wage rates are percentages of the prevailing journey person'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.
	2 <sup>nd</sup> Year	65%	
	3 <sup>rd</sup> Year	75%	
	4 <sup>th</sup> Year	90%	
<b>5400 Hours and 4800 Hours</b>	1 <sup>st</sup> Year	55%	
	2 <sup>nd</sup> Year	70%	
	3 <sup>rd</sup> 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 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 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 Board.

14.3 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.

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

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 Education within 30 days of the decision.



REGULATIONS SPECIFIC TO  
THE REF. & AIR COND. MECHANIC OCCUPATION

1. RATIO OF APPRENTICES TO JOURNEYPERSONS

The ratio of apprentices to journeypersons shall not exceed one apprentice for each journeyperson employed.

REQUIREMENTS FOR RED SEAL CERTIFICATION  
IN THE REF. & AIR COND. MECHANIC 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 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 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 journeyman.
- ▶ 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 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 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.

**SUGGESTED COURSE LAYOUT FOR THE  
Ref. & Air Cond. Mechanic OCCUPATION**

Program & Apprenticeship Registration

**REQUIRED COURSES**

RF1120 - Refrigeration Shop Fundamentals .....	120hrs.
RF1100 - Refrigeration Fundamentals .....	90hrs.
RF1130 - Refrigeration Systems & Components .....	120hrs.
MP1310 - AC/DC Fundamentals .....	90hrs.
RF2110 - Domestic Refrigeration Systems .....	75hrs.
RF1200- Packaged & Split Air Conditioning Systems .....	75hrs.
DR1700 -Basic Drawing & Sketching .....	75hrs.
MP2340 - Three-Phase Systems .....	90hrs.
MP1320 - Single-Phase Transformers .....	30hrs.
DR1700 - Basic Drawing & Sketching .....	75hrs.
OT1220 - Workplace Exposure .....	60hrs.
TS1200 - Precision Measurement .....	60hrs.
TS1300 - Rigging .....	45hrs.
RF2140 - Commercial Refrigeration Systems .....	90hrs.
RF2160 - Compressors .....	75hrs.
WD1210 - Oxy-Fuel Cutting & Welding .....	60hrs.
MP1430- AC Motors and Starters .....	120hrs.
RF1140 - Refrigerant Piping .....	60hrs.
RF2130 - Refrigeration Control Systems .....	90hrs.
RF2150 - Industrial Refrigeration Systems .....	90hrs.
RF2210 - Central Air Conditioning Systems .....	75hrs.
RF2300 - Heat Pumps .....	90hrs.
MP2330-Power Control Circuits .....	60hrs.
*CM2150 - Workplace Correspondence .....	45hrs.
*SD1720 - Entrepreneurial Awareness .....	15hrs.
*MC1050 - Introduction to Computers .....	30hrs.
*MR1210 - Customer Service .....	30hrs.
*SD1700- Workplace Skills .....	30hrs.
*SD1710- Job Search Techniques .....	15hrs.
*SD2330 - QA/QC .....	30hrs.

Required Work Experience

Journeyman Certification

**NAME & NUMBER** RF1120 -Refrigeration 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 a St. John's Ambulance Standard First Aid Course; 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; Lock-out procedures; Electrical safety

**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** 120hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic; Millwright Manual; Occupational Health & Safety Regulations; Health and Safety Manual

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

**DATE DEVELOPED** December 1998

**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 a St. John's Ambulance Standard First Aid Course
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 scriber and markers
5. Use and maintain flaring tools
  - a. Single and double flare tubing
  - b. Bend tubing
  - c. Measure and cut tubing
  - d. Use compression fittings
  - e. Anneal tubing before flaring as may be necessary
  - f. 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. Select and safely use proper tools for given job
  - b. Maintain threading tools
  - c. Make an internal thread
  - d. Make and external thread
  - e. Restore damaged thread
  - f. Remove broken screw
  - g. 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 types of hydraulic and pneumatic lines and fittings and explain their applications
  - e. Describe types of tubing and flaring tools and explain the application of each
  - f. Explain the purpose of threading taps and dies
  - g. Describe the types of fastener tools
  - h. Describe as per the assigned information, rivets, keys, nuts, screws, pins, splines, studs, bolts, snap rings, bonds (thread locking compounds), washers, lock wires and self-locking nuts
  - I. Use and identify fasteners such as rivets, nails, wood screws, sheet metal screws, bolts, nuts, washers, masonry anchors and shields
  - j. Describe specific uses for each fastener
  - k. Recognize sizes of fasteners
  - l. Rivet and soft solder lap joint in galvanized sheet
  - m. Torque bolts
  - n. Identify bolt grades
  - o. 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. Operate portable power tools
  - e. Operate treading machines
  - f. Operate power cleaning equipment
  - g. 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
18. Lock-out procedures
- a. Describe government regulation regarding lock-out procedures
19. Electrical Safety
- a. Recognize electrical hazards in the shop

**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 the operation of common defrost systems; cooling test equipment; evaporators and low pressure recirculating systems; basic absorption systems; Analyze 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** RF1120-Refrigeration Shop Fundamentals

**COURSE DURATION** 90hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

**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. Analyze 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-vapor 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** RF1130 - Refrigeration Systems & Components

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves selecting components, testing components, sizing metering devices, planning system, mounting components, building system, testing pressure, evacuating the system, charging the system, operating the system and recovering refrigerant. It includes information on types and operation of refrigeration systems and component parts.

**MAJOR TOPICS/TASKS**

Install and service cooling towers; Maintain condensers, receivers and cooling towers; Shut down refrigeration system; Install drier and filter; Evacuate and restart system; Install and service condensers and receivers; Operate and maintain refrigeration systems; Service heat exchangers; Perform gas detector calibration for sensor pick up and signal alarm

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for building a basic refrigeration system 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** RF1100 Refrigeration Fundamentals

**COURSE DURATION** 120hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** December 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Install and service cooling towers
  - a. Locate and position cooling towers

- b. Pipe water system
  - c. Determine correct electrical connection made
  - d. Inspect, service and maintain:
    - I. fans and fan motors
    - ii. water pumps and motors
    - iii. water float control and distribution system
    - iv. fan and water pump cycling devices
    - v. damper and damper controls
    - vi. bleed-off and water treatment
2. Identify possible maintenance problems associated with condensers, receivers, and cooling towers
- a. Identify types and explain operation of condensers, receivers and cooling towers
  - b. Explain and describe the use of liquid line driers for Freon systems and to include suction line filters
  - c. Identify two major hazards encountered with the usage of chlorine
  - d. Identify and explain the use of protective equipment for chlorine usage
  - e. State the health hazards encountered with chlorine gas usage
  - f. Discuss the preparation of systems required for chlorine systems operation
  - g. Describe the sizing and capacity of condensers
  - h. Explain the operation of condensers
  - I. Maintain condenser operation
  - j. Maintain control devices
  - k. Maintain cooling tower operations
  - l. Maintain receivers and pressure vessels
  - m. Install a condenser
3. Shut down refrigeration system; install drier and filter; evacuate and restart system
4. Install and service condensers and receivers
- a. Confirm condenser is the correct size and type for the system, before installation
  - b. Read diagrams, prints and schematics
  - c. Mount remote condensers as per specifications:
    - i. air cooled
    - ii. water cooled
  - d. Identify and describe evaporative condensers
    - ii Read and review specifications for evaporative condensers
    - ii Field trip to view evaporative condensers
  - e. Connect piping to condensers including water and water regulating valves (for water cooled) as per specifications
  - f. Connect wiring to electrical motors and other accessories
  - g. Service and clean condenser units

- h. Install and service receivers:
    - I. high pressure
    - ii. low pressure
    - iii. Combination receiver condenser units
  - i. Install and service discharge line oil separation and receiver
  - j. Install connect and maintain head pressure controls and relief devices
  - k. Inspect and adjust fan and water pump cycling devices
5. Operate and maintain refrigeration systems
- a. Explain primary and secondary refrigerants as applicable to direct and indirect systems
  - b. Operate and maintain dry expansion systems
  - c. Operate and maintain flooded systems (2 stages)
  - d. Operate and maintain indirect systems
  - e. Maintain operating log
6. Service heat exchangers
- a. Describe three basic types of heat exchangers as used for refrigerating purposes directly and indirectly
  - b. Explain basic heat exchange principles and sketch a liquid line/suction line exchange
7. Perform gas detector calibration for sensor pick up and signal alarm
- a. Describe gas detection monitoring and alarm systems
  - b. State the basic operating procedures for monitoring and alarm systems
  - c. Describe the purpose of capillary tubes



**NAME & NUMBER** RF1200 - Packaged and Split Air Conditioning Systems

**DESCRIPTION**

This course in air conditioning requires the use of tools and equipment, test instruments and materials and supplies. It involves designing, installing, trouble shooting and servicing packaged and split conditioning systems. It includes information on types and operation of packaged and split air conditioning systems and component parts.

**MAJOR TOPICS/TASKS**

Analyze air conditioning operating and cycle principles; Interpret operation of different system designs; Identify air distribution systems; Install and service split systems; Install and service air cleaners; Install and service humidification units; Install and service de humidification units; Select and use instruments to measure temperature, CFM and pressure of air; Install air filters

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for the installation and maintenance of packaged and split air conditioning 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** RF1100 Refrigeration Fundamentals

**COURSE DURATION** 75hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Analyze air conditioning operating and cycle principles
  - a. Define air conditioning
  - b. Interpret air structures and properties of air
  - c. Calculate heat loads

- d. Measure pressure, temperature, velocity and humidity of air using sling psychrometer, aspirating psychrometer, velocimeter, anemometer, draft gauge, U tube monometer, inclined monometer, pilot tube, barometer and smoke generators
  - e. Use psychometric charts
5. Interpret operation of different system designs:
- a. window air conditioners
  - b. packaged air conditioners
  - c. central air conditioners
  - d. heat pumps
6. Identify air distribution systems:
- a. extended plenum
  - b. reducing trunk
  - c. perimeter loop
2. Install and service split systems
- a. Locate, prepare and mount condensing and evaporator sections
  - b. Connect duct-work to sections
  - c. Erect piping as per specifications
  - d. Interpret and inspect electrical requirements and connections
  - e. Service refrigeration cycle components
  - f. Service air cycle components
  - g. Service low temperature devices
  - h. Service fan and dampen motors
  - I. Service compressor motors
  - j. Service control circuits
  - k. Service capacity control devices
  - l. Troubleshoot and repair system malfunctions
3. Install and service air cleaners
- a. Select, clean or replace stationary filters
  - b. Select, clean or replace rotating filters
  - c. Check pressure drop across filters (efficiency test)
  - d. Check and clean charged media filters
  - e. Test and clean two-stage electronic air cleaners
  - f. Troubleshoot electronic filter power pack
4. Install and service humidification units
- a. Analyze humidification conditions on psychometric chart
  - b. Install and service pan type humidifiers
  - c. Install and service atomizing water spray humidifiers

- d. Install and service air washer humidifiers
  - e. Install and adjust humidity controllers
  - f. Install and service water control components
  - g. Troubleshoot and repair system malfunctions
5. Install and service de humidification units
- a. Install coils in ducts or air handling units
  - b. Pipe coils to cooling equipment
  - c. Insulate materials below dew point temperatures
  - d. Interpret de humidification process on psychometric chart
  - e. Check refrigerant cycle components
  - f. Check air cycle components
  - g. Check water cycle components
  - h. Check specific de humidification controls
6. Select and use instruments to measure temperature, CFM and pressure of air
- a. Identify and describe the use of air measuring instruments
7. Install air filters
- a. Select air cleaners and compare based on ratings, efficiencies and cost
  - b. Schedule maintenance requirements for commercial air cleaners

**NAME & NUMBER** RF2110 - Domestic Refrigeration Systems

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves installation, troubleshooting and repair of domestic refrigeration systems. It includes information on types of domestic refrigeration systems and component parts.

**MAJOR TOPICS/TASKS**

Describe types and explain the operation of domestic refrigeration systems; Repair and service domestic refrigerators and freezers; Install and service window air conditioners

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for the installation and maintenance of domestic 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** RF1100 Refrigeration Fundamentals

**COURSE DURATION** 75hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Describe types and explain the operation of domestic refrigeration systems
2. Repair and service domestic refrigerators and freezers
  - a. Replace evaporators
  - b. Replace condenser and oil coolers
  - c. Replace compressors
  - d. Replace electric defrost heaters and anti-condensation warmers (refrigerators)

- e. Troubleshoot electrical and refrigeration systems
  - f. Replace dryer filters
  - g. Test system for refrigeration leaks
  - h. Replace electrical controls
  - I. Evacuate and recharge system with refrigerant (and oil if required)
  - j. Repair evaporator
  - k. Repair condenser
  - l. Service and repair capillary tubing
3. Install and service window air conditioners
- a. Prepare equipment base
  - b. Interpret electrical requirements
  - c. Interpret water requirements
  - d. Test air handling equipment
  - e. Start equipment as per manufacturer's manuals and adjust controls as required
  - f. Check cooling system capacity
  - g. Check control circuits
  - h. Troubleshoot and repair system malfunctions

**NAME & NUMBER** RF2130 - Refrigeration Control Systems

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves removing, inspecting, testing, rebuilding and replacing refrigeration control devices. It includes information on types and operation of control devices and component parts.

**MAJOR TOPICS/TASKS**

Install and service evaporators and defrost systems; Install and service refrigerant metering devices; Install and service valves and regulators; Operate and maintain flow control devices

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for the installation and maintenance of refrigeration 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** RF2140 Commercial Refrigeration Systems

**COURSE DURATION** 90hrs.

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Install and service evaporators and defrost systems
  - a. Confirm evaporator is correct size and type for the system, before installation
  - b. Read diagrams, prints and schematics
  - c. Mount evaporators as per specifications
  - d. Test and connect electrical connections for electric heating defrost including

- e. sensing controls
  - e. Pipe and connect components for hot gas defrost:
    - I. DY systems
    - ii. liquid recirculating system
    - iii. gravity flooded system
  - f. Connect and service electric fan motors
  - g. Clean and service evaporators
  - h. Inspect and maintain drainlines
2. Install and service refrigerant metering devices
- a. Explain the operation of hand expansion valves, capillary tubes, high and low side floats, automatic expansion valves and thermostatic expansion valves
  - b. Install, test and service high and low side floats
  - c. Install, test and service automatic expansion valves
  - d. Install, test and service thermostatic expansion valves
  - e. Install, test and service manual expansion valves
  - f. Install, test and service capillary tubes
3. Install and service valves and regulators
- a. Install, test and service manual shut-off valves
  - b. Install, test and service automatic shut-off valves
  - c. Install, test and service modulating shut-off valves
4. Operate and maintain flow control devices
- a. maintain solenoid valves
  - b. Maintain suction pressure and evaporator pressure regulators
  - c. Maintain check valves
  - d. Maintain refrigerant driers and moisture indicators

**NAME & NUMBER** RF2140 - Commercial Refrigeration Systems

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves sizing, installation, troubleshooting and repair of commercial refrigeration systems. It includes information on types and operation of commercial refrigeration systems and component parts.

**MAJOR TOPICS/TASKS**

Service commercial systems; Install and service walk-in coolers and freezers; Install and service remote systems; Install and service liquid chillers and secondary cooling systems; Install and service industrial ice making units; Install and service heat reclaim systems

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for installing and maintaining commercial 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** RF2110 - Domestic Refrigeration Systems

**COURSE DURATION** 90hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Service commercial systems
  - a. Add refrigerant to system
  - b. Add oil to compressor units
  - c. Pump-down system as may be required to install components
  - d. Change dryer(s)
  - e. Evacuate non-condensibles from system



- f. Adjust controls such as thermostats, timers hi-lo motor controls, and flow devices
  - g. Adjust drive systems (pulleys, belts and direct drives)
  - h. Clean dirty condensers
  - I. Defrost blocked evaporators
  - j. Test fittings for leaks and tighten or repair as required
  - k. Oil and clean fan motors
  - l. Monitor system for normal operation
2. Install and service walk-in coolers and freezers
- a. Determine refrigeration heat load
  - b. Determine size of components
  - c. Size refrigerant lines
  - d. Locate system components
  - e. Erect piping system
  - f. Leak test system
  - g. Evacuate system
  - h. Charge system with refrigerant
  - I. Test electrical system
  - j. Check system for normal operation
  - k. Adjust controlling devices
  - l. Troubleshoot and repair electrical control problems
  - m. Troubleshoot and repair refrigeration problems
3. Install and service remote systems
- a. Locate and place system components
  - b. Pipe single compressor systems
  - c. Pipe multiple compressor systems
  - d. Pipe single evaporator systems
  - e. Pipe multiple evaporator and multiple temperature evaporator system
  - f. Install refrigerant line devices
  - g. Test system for leaks
  - h. Evacuate system and charge with refrigerant
  - I. Check system for normal operation
  - j. Adjust refrigerant controls
  - k. Adjust electrical controls
  - l. Troubleshoot and repair or replace defective refrigeration components
  - m. Troubleshoot and repair or replace defective electrical components
4. Install and service liquid chillers and secondary cooling systems
- a. Locate and install system components for chiller unit
  - b. Pipe water and refrigerant lines to specifications
  - c. Inspect electrical circuits for correct connections according to specifications

- d. Set-up and check operating and safety controls
  - e. Evacuate and charge the system as required
  - f. Install circulating brine equipment
  - g. Pipe brine system
  - h. Review engineering plans for ice rinks
    - i. Field trip to an ice rink
    - ii. Assemble piping for simulation of rink floor piping
  - i. Charge brine system
  - j. Check brine pH and specific gravity
  - k. Start pumps and check amperage draw
  - l. Start equipment following start-up procedures and make adjustment as required
  - m. Troubleshoot and repair system malfunctions
5. Install and service industrial ice making units
- a. Locate and install equipment
  - b. Remove shipping restraint devices
  - c. Pipe refrigerant connections
  - d. Check electrical power supply connections
  - e. Install system drains
  - f. Evacuate and charge system
  - g. Inspect all safety controls
  - h. Check for proper rotation of motors
  - I. Adjust belts and align direct drive couplings
  - j. Adjust ice cutting knives as per specifications
  - k. Start unit as per manufacturer's operating manuals
  - l. Check system for correct operation and adjust controls as required
  - m. Troubleshoot and repair system malfunctions
5. Install and service heat reclaim systems
- a. Describe the operation and application of heat reclaim coils
  - b. Describe principles and operation of a fresh air-exhaust heat recovery unit
  - c. Sketch and explain the operation of an exhaust fresh air "heat recovery unit"
  - d. Pipe heat reclaim condensers in series
  - e. Pipe heat reclaim condensers in parallel
  - f. Locate and install regulating valves
  - g. Locate and install solenoids and check valves
  - h. Locate and install heat reclaim diverting valve
  - I. Troubleshoot and repair system malfunctions

**NAME & NUMBER** RF2150 - Industrial Refrigeration Systems

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, measuring instruments and materials and supplies. It involves sizing, installing, troubleshooting and repairing industrial refrigeration systems. It includes information on types and operation of industrial refrigeration systems and component parts.

**MAJOR TOPICS/TASKS**

Troubleshoot commercial/industrial refrigeration systems (mechanical); Install and service circulating pumps; Install and service commercial ice making units; Install and service multistage systems; Install and service plate freezers; Install and service blast freezers; Install and service recirculating and liquid transfer equipment; Maintain evaporators and low pressure recirculating systems

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for the installation and maintenance of industrial 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** RF2110 - Domestic Refrigeration Systems

**COURSE DURATION** 90hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Troubleshoot commercial/industrial refrigeration systems (mechanical)
  - a. Identify types, uses and explain the operation of evaporators
  - b. Analyze compressor malfunctions
  - c. Identify condensing unit problems

- d. Identify evaporator problems
  - e. Identify TEV problems
  - f. Identify pressure motor control problems
  - g. Identify liquid line solenoid valve problems
  - h. Identify receiver problems
  - i. Identify filter dryer problem
  - j. Analyze manifold gauge readings to identify possible problem areas in a malfunctioning system
  - k. Identify indications of problem such as:
    - I. non-condensibles in system
    - ii. blocked evaporators
    - iii. overcharged refrigeration system
    - iv. undercharged refrigeration system
    - v. evaporator or condenser fans not operating
  - l. Identify hot gas defrost system problem
  - m. Isolate causes of vibration problems
  - n. Identify and isolate leaks in refrigeration systems
2. Install and service circulating pumps
- a. Install pumps
  - b. Change couplings
  - c. Align pumps
  - d. Inspect and replace seals
  - e. Check clearances
  - f. Check motor amperage draw
  - g. Inspect and replace pump stainers and filters
3. Install and service commercial / industrial ice making units
- a. Identify and explain the different methods of ice manufacturing
  - b. Relate the manufactured ice to the type of ice making assembly
  - c. Recognize and describe ice handling equipment operation
  - d. Explain and sketch screw delivery and air delivery of ice to different usage
  - e. Set up and adjust ice bin controls
  - f. Service and troubleshoot a package ice making unit
  - g. Pipe in supply water
  - h. Install necessary drain lines
  - i. Remove shipping restraint devices
  - j. Connect power source as required
  - k. Start system as per manufacturers manuals
  - l. Check operation and adjust system as required
  - m. Troubleshoot and repair system malfunctions

4. Install and service multistage systems
  - a. Identify multi-stage systems:
    - i. compound-compression system
    - ii. cascade system
  - b. Locate and install system components
  - c. Pipe refrigerant system as per specifications
  - d. Check electrical power supply
  - e. Set up and adjust operating and safety devices
  - f. Evacuate and charge system
  - g. Adjust belts and align direct drive couplings
  - h. Start up unit as per manufacturer manuals
  - I. Check for proper rotation of all motors
  - j. Check operation and adjust controls as required
  - k. Check amperage draw of all motors
  - l. Troubleshoot and repair system malfunctions
  
5. Install and service plate freezers
  - a. Locate and install plate freezer
  - b. Remove shipping constraints
  - c. Install hydraulic ram
  - d. Check electrical power supply connections
  - e. Install bolts and freezer plates and adjust plate spacing
  - f. Install refrigerant piping as per specifications
  - g. Start system as per manufacturer's manuals
  - h. Check defrost operation and set up defrost regulators
  - I. Troubleshoot and repair system malfunctions
  
6. Install and service blast freezers
  - a. Locate coils
  - b. Insure proper placement and rotation of fans
  - c. Install refrigerant piping as per specifications
  - d. Assure system drainage
  - e. Adjust balancing valves
  - f. Inspect fan intakes and plenum for loose debris
  - g. Check operation of blast freezer room vents
  - h. Start equipment as per manufacturer's manuals
  - I. Check for proper operation and adjust controls as required
  - j. Troubleshoot and repair system malfunctions
  
7. Install and service recirculating and liquid transfer equipment
  - a. Locate and install suction accumulator
  - b. Locate and install high pressure receiver

- c. Review operation and service procedures of refrigerate dump trap systems
  - d. Locate and install liquid ammonia pump
  - e. Install interconnecting pipe
  - f. Install necessary controls
  - g. Check electrical circuits
  - h. Troubleshoot and repair system malfunctions
8. Maintain evaporators and low pressure recirculating systems
- a. Maintain evaporator defrosting methods
  - b. Maintain suction line accumulators
  - c. Maintain recirculating system
  - d. Maintain an intercooler
  - e. Operate liquid transfer system
  - f. Maintain oil pot and oil separators
  - g. Install a dry expansion evaporator

**NAME & NUMBER** RF2160 - Compressors

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves removal, inspection, testing, rebuilding and replacing compressors. It includes information on types and operation of compressors and component parts.

**MAJOR TOPICS/TASKS**

Align and adjust pulleys and belts; Align direct drive systems; Install compressor assemblies; Repair compressor assemblies

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for the installation and maintenance of compressors 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** RF1130 Refrigeration Systems & Components

**COURSE DURATION** 75hrs.

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Align and adjust pulleys and belts
  - a. Inspect, replace and adjust V-belts on single and multiple grooved pulleys
  - b. Select pulley sizes and belts to obtain pre-determined speed
  - c. Remove, replace and align pulleys and V-belts
2. Align direct drive systems
  - a. Check base for level

- b. Install motor and compressor for direct coupling
  - c. Align with feeler gauges and straight edge
  - d. Align with dial micrometer
  - e. Check alignment to manufacturer's specifications
  - f. Drill and pin motor and compressor to base
3. Install compressor assemblies
- a. Describe types of compressors and explain their operation
  - b. Explain volumetric efficiency
  - c. Confirm compressor is the correct one for the system
  - d. Prepare and anchor compressor or unit foundations
  - e. Remove and replace or install commercial welded hermetic compressors
  - f. Remove and replace or install bolted (field serviceable) hermetic compressors
  - g. Remove and replace or install external drive compressors
  - h. Align and adjust pulleys and direct drives as required
  - I. Connect piping, tubing couplings and fittings to compressors
  - j. Connect electrical wiring and accessories to compressors
  - k. Test for leaks after installation (refrigerant, oil, water lines)
  - l. Evacuate non-condensibles from system
  - m. Charge system with specified refrigerant
  - n. Check running amperage, oil levels, and operating temperatures
  - o. Perform acid test
4. Repair compressor assemblies
- a. Disassemble, inspect and repair and reassemble open and semi hermetic compressors:
    - I. Reciprocating
    - ii. Rotary
  - b. Test and inspect compressors after reassembly
  - c. Describe the principles of operation, start-up / operating procedures for
    - i. Centrifugal compressor
    - ii. Screw compressor



**NAME & NUMBER** RF2210 - Central Air Conditioning Systems

**DESCRIPTION**

This course in air conditioning requires the use of tools and equipment, test instruments and materials and supplies. It involves designing, installing, troubleshooting and servicing central air conditioning systems. It includes information on types of central air conditioning systems and component parts.

**MAJOR TOPICS/TASKS**

Install and service air handling units; Maintain building ventilating equipment

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for installing and maintaining central air conditioning 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** RF1200 - Packaged & Split Air Systems

**COURSE DURATION** 75hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Install and service air handling units
  - a. Describe the operation of air handling equipment
  - b. Describe the operation of air distribution systems and air handling units
  - c. Explain heat reclaim
  - d. Explain air treatment methods
  - e. Calculate loads
  - f. Explain the operation of heating and cooling coils
  - g. Describe procedures for duct sizing

- h. Describe the installation method of a floor mounted air handling unit
  - i. Describe the installation method of a ceiling air handling unit
  - j. Connect units to duct-work
  - k. Service fans, shafts and motors
  - l. Service air filters
  - m. Check air cycle supply and return
  - n. Explain the procedure for balancing an air distribution system
  - o. Use air conditioning instruments
  - p. Troubleshoot and repair system malfunctions
2. Maintain building ventilating equipment
- a. Maintain louvres and dampers
  - b. Adjust modulating motors as applicable to operating louvres and dampers
  - c. Maintain air handling equipment
  - d. Operate and maintain building heating and ventilating equipment

**NAME & NUMBER** RF2300 - Heat Pumps

**DESCRIPTION**

This course in refrigeration systems requires the use of tools and equipment, test instruments and materials and supplies. It involves sizing, installing, troubleshooting and repairing heat pumps. It includes information on types and operation of heat pumps and component parts.

**MAJOR TOPICS/TASKS**

Define air to air, water to air and ground to air system; Describe types and explain the operation of heat pumps; Install and service heat pumps; Troubleshoot heat pumps.

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for the installation and maintenance of heat 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** RF2100 - Domestic Refrigeration Systems  
MP1430 - AC Motors and Starters  
MP2330 - Power Control Circuits

**COURSE DURATION** 90hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** December 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Define air to air, water to air and ground to air system
2. Describe types and explain the operation of heat pumps
3. Install and service heat pumps

- a. Install outdoor units
  - b. Install indoor units
  - c. Connect refrigerant lines
  - e. Check power supply requirements
4. Troubleshoot heat pumps.
- a. mechanical system
  - b. heating cycle controls
  - c. cooling cycle controls
  - d. defrost cycle controls
  - e. auxiliary heat controls

**NAME & NUMBER** RF1140 - Refrigerant Piping

**DESCRIPTION**

This course in piping fundamentals requires the use of tools and equipment, and 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**

Thread and assemble steel pipe; Bend tubing; Install and replace copper and brass pipe; Maintain piping systems by coding, inspecting, maintaining and repairing; Assemble plastic pipe; Assemble fibreglass pipe; Fabricate and/or install hangers and supports

**PURPOSE / AIMS**

1. To develop the skills and knowledge required for assembling refrigerant 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** RF1120-Refrigeration Shop Fundamentals  
RF1100-Refrigeration Fundamentals

**COURSE DURATION** 60hrs

**LEARNING RESOURCES**

Modern Ref. & Air Cond. Mechanic

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

**DATE DEVELOPED** December 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Thread and assemble steel pipe
  - a. Describe the different pressures and temperatures to which pipes are subjected
  - b. Describe the operation of pressure gauges and explain maintenance and repair procedures
  - c. Select gasket material for high temperature water system, oil systems, cold water

- lines and high pressure steam systems
  - d. Cut a ring and full face gasket for a 4" and 6" flanged joint
  - e. Tighten bolts in proper sequence
  - f. Cut, ream, and thread pipe by hand
  - g. Cut, ream, and thread pipe with machine
  - h. Install fittings on pipe
  - i. Install hangers and supports
  - j. Assemble victualic pipe and fittings
  - k. Install valves on pipe
  - l. Construct piping arrangements using a variety of fittings
  - m. Use thread lubricants on joints for specific services
  - n. Hydrostatically test a pipeline
2. Bend tubing
- a. Bend tube using tube benders
  - b. Hot bend tubing
3. Install and replace copper and brass pipe
- a. Read charts, drawings and piping diagrams and select required piping and fittings for specific applications
  - b. Install a piping circuit using fittings and couplings to establish:
    - i. Changes in direction at 90, 45, and 33 ½ degree angles including T's and wye's
    - ii. Offsets at various angles
    - iii. Reduction of pipe size
  - c. Anneal and bend rigid copper pipe
  - d. Bend pipe using hydraulic bender
  - e. Hot bend steel pipe
  - f. Pickle pipe
  - g. Weld pipe using appropriate torch in different positions:
    - I. Horizontal rolled
    - ii. Horizontal fixed
    - iii. Vertical fixed
    - iv. Overhead fixed
  - h. Cut out and replace a section of pipe
  - i. Introduce inert gas into pipe for brazing, soldering and welding
  - j. Cut threads
  - k. Cut and solder copper pipe
  - l. Cut, ream and thread brass pipe
  - m. Assemble pipe and fittings
  - n. Make a friction clamp
  - o. Construct piping arrangements using a variety of fittings

- p. Join lengths of pipe using coupling, unions and cap or plug at end
  - q. Make cup joints using soldering copper
  - r. Make flat joints using soldering copper
4. Maintain piping systems by coding, inspecting, maintaining and repairing
- a. Code piping systems to indicate product and direction of flow in system
  - b. Repair piping leaks by installing new gaskets, new pipe sections, new pipe fittings and soldering
  - c. Repair and maintain gate, globe, angle check non-return and control valves
  - d. Repair and maintain pipe line filters and strainers
  - e. Repair and maintain piping support systems
  - f. Replace and test safety and relief valves
  - g. Repair and maintain pipe insulation
5. Assemble plastic pipe
- a. Make joints on PVC, ABS, PE, CPVC, and SDR pipe
  - b. Dismantle joints on PVC and ABS pipe
  - c. Join thermo-plastic pipe by welding
  - d. Join plastic pipe by solvent welding
  - e. Join plastic pipe with clamps and insert fittings
  - f. Thread plastic pipe
  - g. Install supports
  - h. Install ground plastic pipe
  - I. Join plastic pipe with victualic couplings
6. Fabricate and/or install hangers and supports
- a. Make templates
  - b. Interpret specification sheets
  - c. Install anchoring devices into:
    - I. Wooden members
    - ii. Gypson and other types of finish wall
    - iii. Concrete
    - iv. Masonry block and brick
  - d. Fabricate hangers and supports for pipe and equipment
  - e. Install pipe hangers and supports
  - f. Install equipment hangers and supports
  - g. Isolate sound and vibration
  - h. Fabricate one-piece angle, or channel wall brackets
  - I. Fabricate three-piece angle, or channel wall brackets
  - j. Fabricate U-bolts

- k. Fabricate clevis hangers
- l. Fabricate a pipe saddle support and a pipe stanchion saddle



**NAME & NUMBER**            MP1310 AC/DC Fundamentals

**DESCRIPTION**

Course provides the training to construct and test basic AC and DC circuits and their components.

**MAJOR TOPICS/TASKS**

Explain electrical fundamentals; Set up an Edison Three-Wire Circuit; Construct basic series and parallel circuits; Test and replace basic wiring components such as terminals, fuses, circuit breakers and resistors; Use VIM and DVOM to check circuit voltage; Use VIM and DVOM to check circuit resistance; Construct basic AC circuits; Use oscilloscope

**PURPOSE / AIMS**

1. To develop the skills and knowledge required to construct and test basic DC and AC circuits.
2. To practice safety in potentially harmful situations
3. To develop an appreciation for conservation and environmental issues

**PREREQUISITES**            None

**COURSE DURATION**        90 hrs

**LEARNING RESOURCES**

Standard Textbook of Electricity

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

**DATE DEVELOPED**          October 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Explain electrical fundamentals
  - a. Explain static electricity and the electron theory.
  - b. Describe the characteristics of conductors and insulators.
  - c. Explain magnetic fields.
  - d. Explain electromagnetism and electromagnetic induction
  - e. Explain system ground.

- f. Diagram and label an emergency lighting system
2. Set up an Edison Three-Wire Circuit
  - a. Describe the operation of three wire circuits.
3. Construct basic series and parallel circuits
  - a. Explain minimization of voltage drop.
  - b. Solve problems on Ohm's Law and Kirchhoff's Law.
  - c. Explain conductor sizes and resistivity and line voltage drop.
  - d. Solve problems on power loss and voltage drop.
  - e. Construct a series circuit
    - i. Measure voltage, current, resistance and power
    - ii. Troubleshoot circuit problems
  - f. Construct a parallel circuit
    - i. Measure voltage, current, resistance and power
    - ii. Troubleshoot circuit problems
  - g. Construct a series/parallel circuit
    - i. Measure voltage, current, resistance and power
    - ii. Troubleshoot circuit problems
4. Test and replace basic wiring components such as terminals, fuses, circuit breakers and resistors
5. Use VIM and DVOM to check circuit voltage
  - a. Describe the use of electric meters.
  - b. Use ammeter to check circuit amperage
6. Use VIM and DVOM to check circuit resistance
7. Construct basic AC circuits
  - a. Describe the reaction of inductors, capacitors, transistors and diodes to electric current
  - b. Explain AC current and voltage
  - c. Describe single phase current and voltage
  - d. Describe capacitance and inductance.
  - e. Describe AC power and power factor.
  - f. Solve problems using vector analysis
  - g. Construct series AC circuits (R, RL, RC, and RLC)
    - i. Measure voltage, current and resistance
    - ii. Make calculations
    - iii. Troubleshoot circuit problems

- h. Construct parallel AC circuits (R, RL, RC, RLC)
    - I. Measure voltage, current and resistance
    - ii. Make calculations
    - iii. Troubleshoot circuit problems
  - I. Construct series/parallel AC circuits (R, RL, RC, RLC)
    - I. Measure voltage, current and resistance
    - ii. Make calculations
    - iii. Troubleshoot circuit problems
8. Use oscilloscope
- a. Specify the use of oscilloscopes
  - b. Measure characteristics of sine waves
  - c. Compare wave forms
  - d. Apply oscilloscope to position from diagram
  - e. Measure voltage of grounded and ungrounded system

**NAME & NUMBER**            MP1430 - AC Motors and Starters

**DESCRIPTION**

Course provides the training to install and maintain AC motors and starters.

**MAJOR TOPICS/TASKS**

Install, test and maintain AC motors; Test and repair AC motors; Test for speed, power, frequency and phase; Install synchronous motors and starters; Connect and verify power factor correction equipment; Install and maintain AC motor starters; Install and maintain electric control circuits.

**PURPOSE / AIMS**

1. To develop the skills and knowledge required to install and maintain AC motors.
2. To develop an appreciation of safety code requirements for AC motor installation and maintenance.

**PREREQUISITES**            MP1310 AC/DC Fundamentals

**COURSE DURATION**        120 hrs

**LEARNING RESOURCES**

Canadian Electrical Code; Standard Textbook of Electricity; Electric Motor Control

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

**DATE DEVELOPED**          October 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Install, test and maintain AC motors
  - a. Describe the operation and the connection of single phase motors
  - b. Describe the operation and the connection of 3 phase motors
  - c. Describe the types of single phase and three phase motors.
  - d. List the electrical code requirements for installation of AC motors.
  - e. Describe single phase and three phase voltage and current.
  - f. Explain overcurrent and overload protection
  - g. Maintain single phase motors
  - h. Test and maintain three phase motors

2. Test and repair AC motors
  - a. Interpret name plate data
  - b. Examine and test AC motors
  - c. Dismantle and clean motors
  - d. Maintain brush mechanism
  - e. Remove and replace bearings, bushings and seals
  
3. Test for speed, power, frequency and phase
  - a. Check speed of equipment (motors, generators, blowers compressors, etc.) using correct test equipment
  - b. Determine frequency of equipment and test for frequency
  - c. Test phase and phase angles
  - d. Determine phase sequence
  
4. Install synchronous motors and starters
  - a. Install synchronous motors
  - b. Install synchronous motor starting equipment
  - c. Maintain synchronous motors and starters
  - d. Test and troubleshoot synchronous motor starting circuits
  
5. Connect and verify power factor correction equipment
  - a. Describe the use and operation of a power factor meter
  - b. Explain power factor improvement
  - c. Use appropriate meters to measure power in watts, volt amperes, power factor and vars
  - d. Install and verify the use of power factor improvers (capacitors and synchronous motors)
  - e. Verify inductive and capacitance effect on currents
  - f. Install capacitors in shunt
  
6. Install and maintain AC motor starters
  - a. Describe the operation of AC motor starters and synchronous motor starters
  - b. Install and maintain manual starters
  - c. Install and maintain single phase magnetic starters complete with controls
  - d. Install and maintain three phase magnetic starters complete with controls
  - e. Install and maintain single phase reversing type magnetic starters
  - f. Install and maintain three phase reversing type magnetic starters
  - g. install and maintain reduced voltage starters
  - h. Install and maintain starting compensator
  - i. Install and maintain mechanical interlocking circuits
  - j. Determine installation requirements according to code
  - k. Install two speed controller for a 2 winding squirrel cage motor

- l. Maintain speed controller for a 2 winding squirrel cage motor
- 
7. Install and maintain electric control circuits
    - a. Describe the different types of control devices, sending units, and circuits
    - b. List the electrical code requirements for the installation of control circuits
    - c. Interpret schematic
    - d. Convert from schematic to panel diagram
    - e. Install control switches
    - f. Install control relay
    - g. Install control protection devices
    - h. Maintain and calibrate controls (brakes, clutches, timers)
    - i. Install and maintain speed controller for wound rotor control
    - j. Install AC quick stop controllers

**NAME & NUMBER**            MP1320 - Single-Phase Transformers

**DESCRIPTION**

Course provides training for installing, connecting and maintaining single-phase transformers.

**MAJOR TOPICS/TASKS**

Install and maintain single phase transformer systems; Install and connect single phase transformers

**PURPOSE / AIMS**

1. To develop the skills and knowledge required to install and maintain single phase transformers.
2. To develop an appreciation of safety code requirements for single phase transformer installation.

**PREREQUISITES**            MP1310 AC/DC Fundamentals

**COURSE DURATION**        30 hrs

**LEARNING RESOURCES**

Canadian Electrical Code; Standard Textbook of Electricity; British Columbia Modules

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

**DATE DEVELOPED**          October 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Install and maintain single phase transformer systems
  - a. Explain electromagnetic induction.
  - b. Describe different of single phase types of transformers.
  - c. Describe transformer cooling methods.
  - d. Describe protective devices used with transformers.
  - e. List the electrical code requirements for single phase transformer installation.
  - f. Explain polarity.
  - g. Describe current transformers and potential transformers.
  - h. Explain voltage, impedance and V-A ratings.

- I. Explain protective grounding and bonding.
  - j. Describe the operation and specify the use of single phase transformers.
  - k. Check transformers for polarity.
  - l. Check transformers for short, ground, continuity and cracked bushings.
  - m. Install a single phase transformer (dry type).
  - n. Install and connect a single phase 3 wire transformer and multi tap.
  - o. Install and connect two single phase transformers in parallel (dry type).
  - p. Identify cooling methods for transformers.
  - q. Install and maintain constant current transformers.
  - r. Install current transformers.
  - s. Install potential transformers.
  - t. Connect, test, and adjust voltage regulators.
2. Install and connect single phase transformers
- a. Troubleshoot single phase transformers
  - b. Calculate fuse size and CL fuse sizes for single phase transformers.
  - c. Connect transformers in parallel



**NAME & NUMBER**            MP2330 - Power Control Circuits

**DESCRIPTION**

Course provides the training for the safe installation and repair of power control circuits.

**MAJOR TOPICS/TASKS**

Install and troubleshoot industrial control circuits; Test and replace industrial control circuits and components containing thyristors; Test and replace controls and sending units; Install and maintain solid state; Maintain optoelectronic components and circuits; Describe lockout procedures; Demonstrate fibre optics

**PURPOSE / AIMS**

1. To develop the skills and knowledge required to install and repair control circuits.
2. To develop an appreciation of safety code requirements for control circuits

**PREREQUISITES**            MP1310-AC/DC Fundamentals

**COURSE DURATION**        60 hrs

**LEARNING RESOURCES**

Canadian Electrical Code; British Columbia Modules; Electronic Devices

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

**DATE DEVELOPED**          October 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Install and troubleshoot industrial control circuits
  - a. Test firing networks
  - b. Use data books
2. Test and replace industrial control circuits and components containing thyristors.
  - a. Silicon control rectifiers (SCR)
  - b. TRIAC
  - c. DIAC
  - d. Unijunction Transistor (UJT)
  - e. Silicon Unilateral

- f. Silicon Control Switch (SCS)
  - g. Silicon Bilateral Switch (SBS)
  - h. Pulse Transformer
- 3. Test and replace controls and sending units
    - a. Describe the operation of sending units and gauges
    - b. Identify, test and replace electrical relays, switches and voltage regulators
    - c. Identify, isolate and repair defective components
    - d. Remove and replace units and/or gauges
  - 4. Install and maintain solid state drives
    - a. Install and maintain DC drives
    - b. Install and maintain AC variable frequency drives
  - 5. Maintain optoelectronic components and circuits
    - a. Explain the operation of LEDs, phototransistors and tunnel diodes
    - b. Test and replace photoelectric cells, photo transistors, light activated SCR's, optical isolators, digital read outs, and LED's
  - 6. Describe lockout procedures
  - 10. Demonstrate fibre optics
    - a. Describe fibre optics

**NAME & NUMBER**            MP2340 - Three-Phase Systems

**DESCRIPTION**

Course provides training for the installation and maintenance of three-phase transformers.

**MAJOR TOPICS/TASKS**

Connect and verify three phase circuits; Install and maintain three phase transformer systems

**PURPOSE / AIMS**

1. To develop the skills and knowledge required to install and maintain three phase transformers.
2. To develop an appreciation of safety code requirements for three phase transformers.

**PREREQUISITES**            MP1320 - Single-Phase Transformers

**COURSE DURATION**        90 hrs

**LEARNING RESOURCES**

Canadian Electrical Code; Standard Textbook of electricity; British Columbia Modules

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

**DATE DEVELOPED**         October 1998

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Connect and verify three phase circuits
  - a. Describe the operation and specify the uses of 3 phase transformers.
  - b. Distinguish between Delta and Wye connections.
  - c. Calculate fuse size and CL fuse size for 3 phase banks.
  - d. Describe phase rotation.
  - e. Explain power factor.
  - f. Explain three phase power.
  - g. Connect a 3 Phase 3 wire Wye circuit and verify voltage and current relationship.
  - h. Connect a 3 phase 3 wire Delta circuit and verify voltage and current relationship.
  - I. Connect a 3 phase 4 wire Wye circuit and verify voltage current relationship.

- j. Connect a 3 phase 4 wire Delta circuit and verify high leg characteristics.
  - k. Identify phase sequence of supply.
2. Install and maintain three phase transformer systems
- a. Describe the types of three phase transformers.
  - b. Describe the types of transformer hookups.
  - c. Explain balance and neutral.
  - d. Connect 3 phase 3 wire transformer and measure phase, line voltage current (dry type).
  - e. Connect 3 phase 4 wire transformer and measure phase, line, and neutral voltage and current (dry type).
  - f. Service and maintain transformer taps.
  - g. Perform dielectric test on oil.
  - h. Connect, test and adjust voltage regulator.
  - I. Install lightning arresters.
  - j. Install surge suppressors.
  - k. Check for balanced neutral.
  - l. Check for dangers of a floating neutral in transformer banking.
  - m. Install over current protection.

**NAME & NUMBER** DR1700- Basic Drawing & Sketching

**DESCRIPTION**

Course provides training in blueprint reading and sketching.

**MAJOR TOPICS/TASKS**

Construct geometric shapes and lines; Explain various views; 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**

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1. Construct geometric shapes and lines
  - a. Describe the alphabet of lines
  - b. List the basic drawing symbols
  - c. Explain what is meant by quality of lines
  - d. Describe metric, mechanical, architectural and civil scales
  - e. Describe the different types of pencil lead grades
  - f. Describe letter types
  - g. Describe lettering instrument types
  - h. Explain spacing, sizes and lettering techniques
  - I. Draw lines to scale
  - j. Scale lines
  - k. Divide lines into equal parts
  - l. Bisect lines

- m. Construct angles
  - n. Bisect angles
  - o. Construct concave and convex curves
  - p. Construct circles, arcs, tangents, ellipses, polygons, etc.
2. Explain various 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. Describe types of dimensions and lines used
  - I. Explain the rules of dimensioning
  - j. Explain the various methods of producing lines
  - k. Identify standard drawing symbols used on electrical, hydraulic and pneumatic drawings
  - l. Identify colour codes used for electrical, hydraulic and pneumatic schematics
  - m. Explain the purpose and methods of dimensioning
  - n. Explain intersections and developments
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 conventions associated with sectional views such as symbols, cutting plane lines, broken-out lines, etc.
  - b. Describe the purpose and types of sectional views
  - c. Locate section
  - d. Select type of view
  - e. Determine scale
  - f. Sketch view
  - g. Dimension sketch
  - h. Make notations
5. Sketch primary auxiliary views

- a. Visualize the view
  - b. Layout the sketch
  - c. Sketch view
  - d. Dimension sketch
  - e. 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**            TS1200 - Precision Measurement

**DESCRIPTION**

This general studies course requires the use of precision measuring instruments. It involves operating, maintaining and storing precision measuring instruments. It includes information on decimals, measuring systems, measurement conversion and purposes of precision measurement.

**MAJOR TOPICS/TASKS**

Semi-precision measuring tools; Precision measuring tools; Decimals; Metric measurements; English/metric conversions; Measuring tool maintenance

**PURPOSE / AIMS**

1.     To develop the skills and knowledge required for making precision measurements

**PREREQUISITES**            None

**COURSE DURATION**        60hrs

**LEARNING RESOURCES**

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

**DATE DEVELOPED**         February 1994

**COURSE OUTLINE / LEARNING OBJECTIVES:**

1.     Describe types and explain the uses of semi-precision measuring tools such as
  - a.     combination
  - b.     set
  - c.     steel rule
  - d.     trammels
  - e.     dividers
  - f.     keyset rule
  - g.     inside and outside calipers
  - h.     surface gauges
  - I.     combination depth and hook rule
  - j.     measuring tape



- k. hermaphrodite calipers and short rule
2. Describe types and explain the use of precision measuring tools such as
    - a. micrometers (all types)
    - b. vernier calipers (all types)
    - c. vernier level protractor
    - d. surface plates (all types)
    - e. telescopic gauges
    - f. small hole gauges
    - g. depth gauges
    - h. precision square
    - I. machinists level
    - j. gauge blocks
    - k. cylindrical square
    - l. angle plates
    - m. height gauge
    - n. dial indicators (all types)
    - o. sine bars
    - p. sine plate
    - q. toolmaker buttons
  3. Solve problems on decimals
  4. Solve problems using metric measurements
  5. Solve problems on English/Metric conversions
  6. Use and maintain precision and semi-precision measuring tools
    - a. Identify and explain the purpose of the given measuring tools
    - b. Measure outside and inside diameters
    - c. Measure projection and depth
    - d. Measure runout, endplay and backlash
    - c. Maintain measuring tools

**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**            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**            RF1120-Refrigeration 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 90° FREEHAND
  - e. Cut mild steel 90° GUIDED
  - f. Cut mild steel at a 30° BEVEL FREEHAND
  - g. Cut mild steel at a 30° 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.)

**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 listening
- 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

**COURSE OUTLINE - SP 2330**

**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 DESCRIPTION**

**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 hrs

**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**



**COURSE OUTLINE - SD 1700**

**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.
  - h. Explain the procedure to delay discussion of motions.
  - i. 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 EXPERIENCE

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.

### **REQUIRED WORK EXPERIENCES:**

Install, service, operate and maintain basic refrigeration systems

Install, service and repair domestic refrigeration systems including air conditioners

Select, install, service, and maintain packaged and split air conditioning systems

Remove, inspect, test, rebuild and replace refrigeration control devices

Size, install, troubleshoot, service and repair a variety of industrial refrigeration systems including ammonia recirculating systems, ammonia two stage systems and indirect refrigeration systems

Size, install, troubleshoot, service and repair a wide variety of commercial refrigeration systems including supermarket freezers and coolers, ice arenas, and industrial ice makers

Size, install, troubleshoot, service and repair heat pumps

Size, install, troubleshoot, service and repair central air conditioning systems.