Plan of Training

Tower Crane Operator

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Advanced Education and Skills
Apprenticeship and Trades Certification Division

October 2012

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Approved by:

Chairperson, Provincial Apprenticeship and Certification Board

Date: Nov 6 2012

Preface

This Apprenticeship Standard is based on the 2012 edition of the National Occupational Analysis for the Tower Crane Operator trade.

Acknowledgements

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this Apprenticeship Curriculum Standard. Without their dedication to quality apprenticeship training, this document could not have been produced.

We offer you a sincere thank you.

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Approved	**2012-10-23**	**September 2012**	**Updated Related Courses**

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A. Profile Chart

OCCUPATIONAL SKILLS			
LC1040 Shop Fundamentals for Crane Operators	LC1100 Crane Operation Safety	TC1100 Introduction to Tower Cranes	TC1120 Access Equipment
CRANE INSPECTION AND MAINTENANCE			
LC1110 Crane Maintenance	TC1110 Tower Crane Components	TC1130 Electrical Systems	TC1140 Mechanical Systems
LC1200 Hydraulics and Applications to Crane Control			
CRANE SET-UP, HOISTING CALCULATIONS AND LIFT PLANNING			
LC1130 Crane Operations	TC1150 Tower Crane Load Charts	TC1160 Assembly and Disassembly	TC1170 Pre-Lift Planning
RIGGING			
LC1260 Rigging for Crane Operators			
CRANE OPERATIONS			
LC1130 Crane Operations	TC1180 Climbing and Lowering	TC1190 Specialty Crane Operations	TC1200 Tower Crane Profiles
LC1200 Hydraulics and Applications to Crane Control			

B. NOA Comparison Table

NOA 2012 Tasks		2012 POT	
Task 1 – Performs safety related functions.			
1.01	Uses personal protective equipment (PPE) and safety equipment.	LC1040	Shop Fundamentals for Crane Operators
		LC1110	Crane Maintenance
		LC1100	Crane Operation Safety
1.02	Maintains safe work environment.	LC1100	Crane Operation Safety
Task 2 – Contributes to workplace organization.			
2.01	Communicates with others.	LC1130	Crane Operations
		LC1260	Rigging for Crane Operators
2.02	Uses documentation.	LC1100	Crane Operation Safety
		LC1110	Crane Maintenance
Task 3 – Performs pre-operational checks and regular inspections.			
3.01	Inspects structural components.	TC1110	Tower Crane Components
3.02	Inspects mechanical components	TC1140	Mechanical Systems
		LC1110	Crane Maintenance
3.03	Inspects lines and wire ropes.	LC1260	Rigging for Crane Operators
3.04	Inspects hydraulic system components.	LC1200	Hydraulics and Applications to Crane Control Systems
		LC1110	Crane Maintenance
3.05	Inspects electrical system components.	TC1130	Electrical Systems
3.06	Inspects support components.	TC1110	Tower Crane Components
3.07	Inspects track travel components.	TC1110	Tower Crane Components
3.08	Inspects cab components.	TC1110	Tower Crane Components
3.09	Inspects safety and access components.	TC1110	Tower Crane Components
3.10	Completes inspection documentation.	LC1110	Crane Maintenance
		LC1100	Crane Operation Safety
Task 4 – Performs Continual Checks.			
4.01	Monitors site conditions.	LC1100	Crane Operation Safety
4.02	Monitors lines and wire ropes.	LC1260	Rigging for Crane Operators
4.03	Monitors equipment performance and conditions.	LC1100	Crane Operation Safety
4.04	Monitors structural and support components.	LC1100	Crane Operation Safety

NOA 2012 Tasks		2012 POT	
Task 5 – Performs minor crane maintenance.			
5.01	Maintains mechanical components.	LC1110	Crane Maintenance
		TC1140	Mechanical Systems
5.02	Lubricates wire ropes and crane components	TC1110	Tower Crane Components
Task 6 – Participates in tower crane assembly and disassembly.			
6.01	Participates in crane assembly.	TC1160	Assembly and Disassembly
6.02	Participates in crane disassembly.	TC1160	Assembly and Disassembly
6.03	Transports self-erecting tower crane.	TC1160	Assembly and Disassembly
6.04	Participates in assembly and disassembly of self-erecting tower cranes.	TC1160	Assembly and Disassembly
Task 7 – Plans lifts.			
7.01	Interprets load charts.	LC1130	Crane Operations
		TC1150	Tower Crane Load Charts
7.02	Plans work procedures.	LC1130	Crane Operations
		TC1150	Tower Crane Load Charts
7.03	Prepares for specialty lifts.	LC1130	Crane Operations
		LC1260	Rigging for Crane Operators
Task 8 – Inspects and maintains rigging equipment.			
8.01	Identifies deficiencies in slings and hardware.	LC1260	Rigging for Crane Operators
8.02	Lubricates slings and hardware.	LC1260	Rigging for Crane Operators
8.03	Stores rigging equipment.	LC1260	Rigging for Crane Operators
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9.01	Selects required rigging equipment.	LC1260	Rigging for Crane Operators
9.02	Rigs load.	LC1260	Rigging for Crane Operators
9.03	Monitors rigging.	LC1260	Rigging for Crane Operators
Task 10 – Performs pre-lift (warm-up) activities.			
10.01	Performs function test.	TC1170	Pre-lift Planning
10.02	Confirms limits.	TC1170	Pre-lift Planning
Task 11 – Operates tower cranes.			
11.01	Trolleys carriage.	LC1130	Crane Operations
		TC1190	Specialty Crane Operations
11.02	Booms (luffs) up and down.	LC1130	Crane Operations
11.03	Swings (slews) jib.	LC1130	Crane Operations
11.04	Hoists load.	LC1130	Crane Operations
11.05	Travels crane.	LC1130	Crane Operations
		TC1190	Specialty Crane Operations

NOA 2012 Tasks		2012 POT	
11.06	Performs functions simultaneously.	LC1130	Crane Operations
Task 12 – Climbs (raises) tower cranes.			
12.01	Performs bottom-climbing procedures.	TC1180	Climbing and Lowering
12.02	Performs top-climbing procedures.	TC1180	Climbing and Lowering
Task 13 – Performs specialty tower crane operations			
13.01	Participates in multi-crane lifts.	TC1190	Specialty Crane Operations
13.02	Operates in multi-crane site.	TC1190	Specialty Crane Operations
13.03	Hoists personnel.	TC1190	Specialty Crane Operations
Task 14 – Shuts down and secures tower cranes.			
14.01	Secures crane while leaving controls.	LC1130	Crane Operations
14.02	Secures crane while unattended.	LC1130	Crane Operations
14.03	Secures crane for extended periods.	LC1130	Crane Operations

C. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable

The order of course delivery within each block can be determined by the educational agency, as long as pre-requisite conditions are satisfied.

Upon completion of an entry-level program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

Block I				
Course No.	**IPG No.**	**Course Name**	**Hours**	**Pre-Requisite(s)**
TS1510	-	Occupational Health and Safety	6	None
TS1520	-	WHMIS	6	None
TS1530	-	Standard First Aid	14	None
LC1040	CRA-025 CRA-030	Shop Fundamentals for Crane Operators	60	None
LC1100	CRA-005	Crane Operation Safety	75	None
LC1110	TCO-220	Crane Maintenance	60	None
LC1130	CRA-065	Crane Operations	60	LC1100 LC1110 LC1200
LC1200	TCO-210	Hydraulics and Applications to Crane Control	15	LC1040
LC1260	CRA-035 CRA-040 CRA-045 CRA--085	Rigging for Crane Operators	60	None
AP1101	-	Introduction to Apprenticeship	15	None
*AM1100	-	Math Essentials	30	None
AM1340	-	Hoisting Math Fundamentals	30	AM1100

Block I				
Course No.	**IPG No.**	**Course Name**	**Hours**	**Pre-Requisite(s)**
CM2160	-	Communication Essentials	45	None
SD1760	-	Workplace Essentials	45	None
MC1060	-	Computer Essentials	15	None
TC1100	TCO-100	Introduction to Tower Cranes	3	None
TC1110	TCO-200	Tower Crane Components	30	TC1100
TC1120	TCO-205	Access Equipment	30	TC1100
TC1130	TCO-215	Electrical Systems	15	TC1110 TC1120
TC1140	TCO-220	Mechanical Systems	15	TC1110 TC1120
TC1150	TCO-225	Tower Crane Load Charts	60	TC1130 TC1140
TC1160	TCO-230	Assembly and Disassembly	30	TC1150
TC1170	TCO-240	Pre-lift Planning	6	TC1160
TC1180	TCO-265	Climbing and Lowering	6	TC1170
TC1190	TC0-270	Specialty Crane Operations	6	TC1170
TC1200	TCO-250 TCO-255 TCO-260	Tower Crane Profiles	9	TC1170
		Total Course Credit Hours	**746**	

***A student who can meet the mathematics requirement through an ACUPLACER® test may be exempted from AM1100 - Math Essentials. Please check with your training institution**

Required Work Experience

BLOCK I

TS1510 Occupational Health and Safety

Learning Outcomes:

- Demonstrate knowledge of how to prevent accidents and illnesses.
- Demonstrate knowledge of improve health and safety conditions in the workplace.

Duration: 6 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Interpret the Occupational Health and Safety Act laws and regulations.
    i. explain the scope of the act
        - application of the Act
        - Federal/Provincial jurisdictions
        - Canada Labour Code
        - rules and regulations
        - private home application
        - conformity of the Crown by the Act

2. Explain responsibilities under the Act and Regulations.
    i. duties of employer, owner, contractors, sub-contractors, employees, and suppliers

3. Explain the purpose of joint health and safety committees.
    i. formation of committee
    ii. functions of committee
    iii. legislated rights
    iv. health and safety representation
    v. reporting endangerment to health
    vi. appropriate remedial action
    vii. investigation of endangerment

viii. committee recommendation
ix. employer's responsibility in taking remedial action

4. Examine right to refuse dangerous work.
    i. reasonable grounds for refusal
    ii. reporting endangerment to health
    iii. appropriate remedial action
    iv. investigation of endangerment
    v. committee recommendation
    vi. employer's responsibility to take appropriate remedial action
    vii. action taken when employee does not have reasonable grounds for refusing dangerous work
    viii. employee's rights
    ix. assigning another employee to perform duties
    x. temporary reassignment of employee to perform other duties
    xi. collective agreement influences
    xii. wages and benefits

5. State examples of work situations where one might refuse work.

6. Describe discriminatory action.
    i. definition
    ii. filing a complaint procedure
    iii. allocated period of time a complaint can be filed with the Commission
    iv. duties of an arbitrator under the Labour Relations Act
    v. order in writing inclusion
    vi. report to commission allocated period of time to request arbitrator to deal with the matter of the request
    vii. notice of application
    viii. failure to comply with the terms of an order
    ix. order filed in the court

7. Explain duties of commission officers.
    i. powers and duties of officers
    ii. procedure for examinations and inspections
    iii. orders given by officers orally or in writing
    iv. specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier

v. service of an order
vi. prohibition of persons towards an officer in the exercise of his/her power or duties
vii. rescinding of an order
viii. posting a copy of the order
ix. illegal removal of an order

8. Interpret appeals of others.
    i. allocated period of time for appeal of an order
    ii. person who may appeal order
    iii. action taken by commission when person involved does not comply with the order
    iv. enforcement of the order
    v. notice of application
    vi. rules of court

9. Explain the process for reporting of accidents.
    i. application of act
    ii. report procedure
    iii. reporting notification of injury
    iv. reporting accidental explosion or exposure
    v. posting of act and regulations

Practical Requirements:

1. Conduct an interview with someone in your occupation on two or more aspects of the act and report results.

2. Conduct a safety inspection of shop area.

TS1520 Workplace Hazardous Materials Information System (WHMIS)

Learning Outcomes:

- Demonstrate knowledge of interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health and Safety Act.

Duration: 6 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define WHMIS safety.
    i. rational and key elements
    ii. history and development of WHMIS
    iii. WHMIS legislation
    iv. WHMIS implementation program
    v. definitions of legal and technical terms

2. Examine hazard identification and ingredient disclosure.
    i. prohibited, restricted and controlled products
    ii. classification and the application of WHMIS information requirements
    iii. responsibilities for classification
        - the supplier
        - the employer
        - the worker - Classification: rules and criteria
        - information on classification
        - classes, divisions and subdivision in WHMIS
        - general rules for classification
        - class A - compressed gases
        - class B - flammable and combustible materials
        - class C - oxidizing material
        - class D - poisonous and infectious material
        - class E - corrosive material
        - class F - dangerously reactive material

iv. products excluded from the application of WHMIS legislation
- consumer products
- explosives
- cosmetics, drugs, foods and devices
- pest control products
- radioactive prescribed substances
- wood or products made of wood
- manufactured articles
- tobacco or products of tobacco
- hazardous wastes
- products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act

v. comparison of classification systems - WHMIS and TDG
vi. general comparison of classification categories
vii. detailed comparison of classified criteria

3. Explain labeling and other forms of warning.
   i. definition of a WHMIS label
      - supplier label
      - workplace label
      - other means of identification
   ii. responsibility for labels
      - supplier responsibility
      - employer responsibility
      - worker responsibility
   iii. introduce label content, design and location
      - supplier labels
      - workplace labels
      - other means of identification

4. Introduce material safety data sheets (MSDS).
   i. definition of a material safety data sheet
   ii. purpose of the data sheet
   iii. responsibility for the production and availability of data sheets
      - supplier responsibility
      - employer responsibility
      - workers responsibility

Practical Requirements:

1. Locate WHMIS label and interpret the information displayed.

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

TS1530 Standard First Aid

Learning Outcomes:

- Demonstrate knowledge of recognizing situations requiring emergency action.
- Demonstrate knowledge of making appropriate decisions concerning first aid.

Complete a **St. John Ambulance or Canadian Red Cross** Standard First Aid Certificate course.

Duration: 14 Hours

Pre-Requisite(s): None

LC1040 Shop Fundamentals for Crane Operators

Learning Outcomes:

- Demonstrate knowledge of various shop tools and equipment and their applications.
- Demonstrate knowledge of safety regulations in the operation and maintenance of shop tools.
- Demonstrate knowledge of the use of shop tools in a safe and competent manner.
- Demonstrate knowledge of operating oxy-fuel heating and cutting equipment.

Duration: 60 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Shop Safety.
    i. explain the importance of safe work habits
    ii. identify the required personal safety equipment for crane operators
    iii. explain the importance of implementing exhaust control procedures
    iv. explain the effects of excessive noise on hearing
    v. identify factors that contribute to spontaneous combustion
    vi. identify potential hazards to personal safety
    vii. identify unsafe work conditions
    viii. explain the importance of reporting accidents

2. Fasteners.
    i. identify fasteners such as rivets, nails, wood screws, sheet metal screws, bolts, nuts, washers, masonry anchors, and shields
    ii. describe specific sizes for each fastener
    iii. identify sizes of fasteners
    iv. identify bolt grades
    v. identify miscellaneous anchoring devices

3. Describe the procedures to select, safely use, and maintain the following hand tools.
    i. screwdrivers
        - standard
        - phillips
        - robertson
        - torx
    ii. pliers
        - combination
        - gripping
        - cutting
        - vise-grips
        - snap ring
        - needle nose
    iii. special hose clamp tools
    iv. wrenches
        - open-end
        - box ends
        - ratcheting box ends
        - special purpose (box)
        - adjustable
        - pipe
        - spanner
        - Allen and multi-spline (metric and imperial)
    v. sockets and drives (metric and imperial)
        - drive sizes
        - socket points
        - deep sockets
        - flexible sockets
        - drive handles
        - speed handles
        - ratchets
        - universal joints
        - adapters
        - extensions
    vi. hammers
        - ball peen
        - cross peen

- plastic tip
- brass-headed
- rubber mallets
- dead blow
- sledge hammers
- hammer handles

vii. punches
- starting
- pin
- centre
- aligning

viii. torque wrenches
- types
- sizes
- purpose

ix. torque multiplier

x. hacksaws
- types and designs
- blade classification and selection

xi. files

4. Describe the procedures to select, safely use and maintain the following power tools.
   i. portable
   ii. cleaning equipment
   iii. drilling equipment
   iv. metal cutting
   v. grinders

5. Identify types of compressors.

6. Describe the procedures to select, safely use, and maintain compressors.

7. Describe the procedures to select, safely use, and store the following shop equipment.
   i. jacks
   ii. shop cranes
   iii. chain hoists

iv. steam cleaners
v. solvent cleaning tanks

8. Describe the procedures to select, safely use, and maintain the following measuring tools.
   i. calipers
   ii. measuring tapes
   iii. wire rope gauges
   iv. sheave gauges
   v. anemometers
   vi. feeler gauges

9. Describe procedures to operate oxy-fuel heating and cutting equipment to industrial safety standards for the removal and/or installation of parts.
   i. follows safety precautions
      - safety apparel
      - storage and handling of welding gases
      - pre-operational inspection
   ii. setting up equipment
      - cylinders
      - gauges
      - regulators
      - valves-flame arrestor
      - torches and tips
      - hoses
      - testing for leaks
   iii. operating the torch
      - lighting procedures
      - types of flames and effect on materials
      - shutting down procedures

10. Describe procedures to perform braze welding using oxy-acetylene equipment.

11. Describe procedures to perform flame cutting with oxy-acetylene equipment.

Practical Requirements:

1. Use and maintain personnel protective equipment.
2. Complete a shop safety inspection.
3. Implement exhaust control procedures in a shop.
4. Use hand tools.
5. Use and maintain various cutting tools.
6. Use various fasteners.
7. Use power tools.
8. Use compressed air systems.
9. Use and store of shop equipment.
10. Pre-check, light and adjust oxy-fuel welding and cutting equipment.
11. Perform flame cutting with oxy-fuel equipment.
12. Perform proper shut down procedures with oxy-fuel welding and cutting equipment.

LC1100 Crane Operation Safety

Learning Outcomes:

- Demonstrate knowledge of various codes and regulations required for the safe
- operation of cranes.
- Demonstrate knowledge of good safety practices in crane operations.
- Obtain the following certificates:
  - Professional Driver Improvement
  - Transportation of Dangerous Goods
  - Powerline Hazards
  - Traffic Control and Flagging

Duration: 75 Hours

Pre-requisite(s): None

Objectives and Content:

1. Personnel Protective Equipment.
   i. identify the compulsory personnel protective equipment required for Crane Operators and state its purpose
   ii. state the minimum or C.S.A. codes for compulsory safety gear
   iii. explain when safety items should be replaced

2. Warning signs, symbols and danger tags.
   i. locate and identify, using operator's manual or the actual machine, any warning tag or warning symbol
   ii. correctly match symbols to corresponding meanings
   iii. state the steps to follow when a warning tag or symbol is discovered or when an operator is required to attach a warning tag or symbol to a machine

3. Mount and dismount equipment.
    i. identify, from diagrams or from the actual machine, all safety grab-irons, handrails, steps, and foot-pegs used when mounting or dismounting equipment

4. Safe clearance in work areas.
    i. state the minimum safe operating clearance for the overhead, sides, forward and rearward clearance of obstacles
    ii. state the conditions for determining equipment operating clearances on the job

5. Dangerous operating situations.
    i. identify factors that lead to dangerous operating situations: physiological (body), psychological (mental) mechanical failures, meteorological (weather) and terrestrial (land) conditions
    ii. identify operational malpractice and poor habits that lead to accidents

6. Enclosed areas.
    i. explain the safety procedures to use when running an engine in an enclosed area
    ii. identify the toxic fumes that are associated with engine exhaust gases
    iii. identify hoses and attachments needed to connect the engine exhaust pipe to a central ventilation system in a maintenance shop
    iv. identify devices used to control exhaust fumes from engines when working in an underground work site

7. Fire prevention.
    i. identify the components of the fire triangle
    ii. identify types of fire extinguishers and explain how they work

8. Environmental concerns and safe practices regarding work site.
    i. state the provincial regulations governing exhaust flame or spark arrestor while operating machinery in the forest
    ii. list overhead/underground services that may be found on federal, provincial, municipal, and private lands
    iii. identify the issues the operator should have knowledge of before actual set-up
    iv. state the importance of containing and reporting spills
    v. state the procedure for containment and reporting spills

Practical Requirements:

1. Clean and inspect safety gear.

2. Adjust and fasten fall arrest equipment (seat belts & safety harnesses).

3. Mount/dismount equipment.

4. Demonstrate the use of a fire extinguisher.

LC1110 Crane Maintenance

Learning Outcomes:

- Demonstrate knowledge of various codes and regulations required for inspecting and maintaining cranes.
- Demonstrate knowledge of good safety practices when maintaining cranes.
- Demonstrate knowledge of conservation and environmental issues when maintaining cranes.

Duration: 60 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Service manuals.
    i. identify the various sections of service manuals
        - maintenance
        - servicing
        - lubrication procedures
    ii. interpret information in the manual
    iii. explain the importance of complying with service manuals

2. Ordering parts.
    i. locate the machine serial number or Vehicle Identification Number (V.I.N.)
    ii. locate the engine specifications plate and serial number
    iii. complete a sample order form

3. Lubricants and their purposes.
    i. locate the various components of the lubrication system and list the servicing period for each
    ii. identify the various grades of oils to use under various temperature conditions
    iii. identify correct greases
    iv. identify the performance of grease under extreme load and heat

v. state the functions of engine oil
vi. identify the various additives used in engine oil and the advantages and disadvantages of each
vii. identify the characteristics of gear lubricants
viii. define the Engine Service Classification as presented by the American Petroleum Institute (A.P.I)

4. Crane log book.
   i. locate and state the purpose of the service meter

5. Servicing and charging batteries.
   i. identify the rules pertaining to the care and maintenance of batteries
   ii. explain the procedure to clean and service a battery
   iii. explain how to measure battery electrolyte with a hydrometer
   iv. explain how to connect a charger to battery terminals

6. Maintaining fuel systems.
   i. identify the components of a fuel system
   ii. explain how to prime a fuel system
   iii. state the procedure used to service a fuel system
   iv. state the procedure to follow in refueling a machine
   v. state the precautions to be followed during refueling

7. Maintaining cooling systems.
   i. identify the components of the cooling system
   ii. select a coolant for a given machine
   iii. explain the process used to test anti-freeze solution
   iv. explain the importance of and ways to maintain a cooling system by checking for plugged radiator core or bent fan blades

8. Identify start-up and shut down procedures as prescribed in the service manual.

9. Identify the various attachments available, the purpose and maintenance of each attachment.

10. Describe the maintenance and adjustments required for tracks, tires and wheels.

Practical Requirements:

1. Follow a maintenance procedure.

2. Assist in changing lubricating fuels and filters.
    i. select correct grease
    ii. load a grease gun
    iii. grease a piece of equipment
    iv. assist in changing engine oil and a filter on a piece of equipment
    v. assist in changing transmission fluid and filter on a piece of equipment
    vi. adhere to the regulations pertaining to storage and disposal fluids

3. Affix a warning sign where it can be easily recognized on a piece of equipment.

4. Assist in priming and servicing a fuel system.
    i. drain water from tank and sediment bowl
    ii. change fuel filters
    iii. change a water separator

5. Refuel a machine.

6. Service and charge a storage battery.
    i. follow rules pertaining to the care and maintenance of batteries
    ii. clean and service a battery
    iii. measure battery electrolyte with a hydrometer
    iv. connect a charger to battery terminals

LC1130 Crane Operations

Learning Outcomes:

- Demonstrate knowledge of various codes and regulations required for operating cranes.
- Demonstrate knowledge of good safety practices when operating cranes.
- Demonstrate knowledge of conservation and environmental issues related to crane operations.
- Demonstrate knowledge of new crane technology.
- Demonstrate knowledge of computer assisted safety devices, LMI/Load Indicators and procedures for use.

Duration: 60 Hours

Pre-Requisites: LC1100, LC1110, LC1200

Objectives and Content:

1. Describe the crane operation occupation in terms of the work of a crane operator.
    i. the crane operator's working conditions
    ii. the responsibilities of the various parties involved with crane operation

2. Describe cranes.
    i. identify types and uses of cranes
    ii. describe various crane attachments

3. State the characteristics of hydraulic boom and lattice boom cranes.

4. Explain the principles of leverage associated with crane operation.
    i. leverage and stability
    ii. forward and backward stability factors
    iii. rotation of upperworks (leverage and capacity)
    iv. leverage calculations

5. Describe the purpose and applications of signaling.
    i. identify all hand signals used in crane operations
    ii. identify other construction hand signals which may cause confusion for crane operation
    iii. interpret signals
    iv. identify audible signals for cranes

6. Define quadrants of operation.
    i. define quadrants and sweep area
    ii. explain division of sweep area into quadrants

7. Interpret load charts for pre-lift planning and hoisting operations.
    i. describe configuration of crane bases and booms
    ii. describe quadrants of operation and their effects on load charts
    iii. describe boom lengths and their effects on load charts
    iv. describe effects on values of boom angle, boom length, and load radius for chart listings

8. Define jib and jib offset.
    i. fixed jibs
    ii. luffing jibs

9. State the differences between gross capacity versus net capacity load on a crane.
    i. identify the purpose of range diagrams
    ii. describe how to use range diagrams

10. Describe boom extension types and lengths.
    i. full power telescopic
    ii. pinned telescopic booms

11. State the factors that reduce capacity.
    i. effects of increased load radius
    ii. effects of rapid swing rate
    iii. effects of impact loading and rapid acceleration or deceleration of load
    iv. effects of high wind speeds
    v. duty cycle operations

12. Discuss safety considerations for short-term and long-term shutdowns.

13. Describe structural failure and stability failure.

14. Determine conditions of a load chart.
    i. calculate parts of line
    ii. calculate weight of line
    iii. weight of hook block

15. Determine main boom capacities.
    i. list capacity deductions
    ii. calculate net capacities

16. Describe the principles of crane operation.
    i. define leverage and stability
    ii. perform leverage calculations
    iii. describe changes in crane leverage and capacity during rotation of upperworks.
    iv. describe forward and backward stability factors
    v. describe structural failure
    vi. describe wire rope safety factors for crane running and stationary ropes

17. Describe main boom gross capacity for:
    i. lattice boom
    ii. hydraulic boom
    iii. pinned telescopic boom
    iv. jibs and/or boom extension(s) installed for all crane types

18. Determine main boom capacities with jibs or boom extensions installed.
    i. determine the effective weight of jibs and boom extensions
    ii. list capacity deductions
    iii. calculate net capacities

19. Determine jib and boom extension capacities for lattice booms.
    i. determine effective weight of jib
    ii. list capacity deductions
    iii. calculate net jib capacities using each method

20. Determine jib and boom extension capacities for full telescopic booms.
    i. calculate boom extension capacities

ii. calculate jib capacities
iii. calculate boom extension and jib combination capacities

21. Determine jib and boom extension capacities for pinned telescopic booms.
    i. calculate boom extension capacities
    ii. calculate jib capacities
    iii. calculate boom extension and jib combination capacities

22. Describe inspection procedures for a crane carrier.

23. Describe the procedures for starting, moving, and proper shut down of a crane carrier.

24. Describe the procedures to transport and operate cranes.
    i. safety pre-cautions for preparing and travelling cranes
    ii. identify municipal considerations for travelling cranes
    iii. define the operator's responsibility to prevent accidents, and the need for safety when travelling and operating cranes
    iv. identify manufacturer's recommendations or special precautions regarding travelling of cranes to and from job sites
    v. determine the maximum allowable ground speed while travelling, corresponding to the cranes that are selected
    vi. identify what warning sign(s) if any, must be attached to cranes while travelling to and from job sites
    vii. determine clearances required for transporting and operating cranes

25. Describe conditions which prohibit crane operation.
    i. identify machine configurations that do not meet specifications
    ii. describe improper use of outriggers
    iii. state the importance of the crane being level and the potential danger of instability
    iv. describe crane leveling procedures
    v. describe ground conditions and blocking procedures
    vi. identify what weather and atmospheric conditions that can restrict crane operation
    vii. describe eccentric reeving

26. Plan for performing a lift.
    i. identify and evaluate work to be performed
    ii. describe considerations influencing lifting procedures
    iii. analyze factors influencing equipment selection
    iv. interpret an engineered lift
    v. plan a multiple crane lift

27. Identify and describe new model cranes.
    i. range of capacities available
    ii. range of boom lengths available
    iii. manufacturers
    iv. advantages/disadvantages

28. Describe the upper structure characteristics of new model cranes.
    i. boom technology
    ii. telescoping and pinning systems
    iii. heavy lift attachments

Practical Requirements:

1. Prepare and perform a multi-crane lift.
    i. receive and respond to signals in an actual crane operation

2. Inspect, start-up and shut down a crane carrier.

LC1200 Hydraulics and Applications to Crane Control

Learning Outcomes:

- Demonstrate knowledge of the principles of hydraulic systems.
- Demonstrate knowledge required for inspecting and maintaining crane hydraulic systems.
- Demonstrate knowledge of good safety practices when inspecting and maintaining hydraulic systems.
- Demonstrate knowledge of conservation and environmental issues.

Duration: 15 Hours

Pre-Requisite(s): LC1040

Objectives and Content:

1. Describe the principles of power transfer through hydraulic systems.
    i. basic principles of hydraulics
    ii. how a hydraulic system works
    iii. open and closed systems
    iv. implications for crane hydraulics

2. Describe the transmission of engine power to hydraulic power through such functions as:
    i. swinging/slewing
    ii. boom/up/down
    iii. boom extension and retraction of hydraulic booms
    iv. hydraulic pumps and motors

3. Describe the construction and operation of a basic hydraulic system.

4. Describe how hydraulic fluid is used in the operation of:
    i. different types of valves
    ii. different types of pumps
        - displacement of pumps
    iii. different types of hydraulic cylinders
        - piston cylinders
        - cylinders on cranes

5. Describe the operation of the following hydraulic system components.
    i. motors
    ii. accumulators
    iii. filters
    iv. reservoirs
    v. monitoring devices
    vi. hoses and fittings
    vii. adapters
    viii. SAE O-rings
    ix. flangeheads
    x. seals

6. Describe the qualities required for hydraulic fluids.
    i. properties of fluids

7. Describe the effect of cold weather and contaminants in a system.

8. Describe the maintenance of fluid levels and precautions when checking.

9. Describe the relationship of electric systems to hydraulic systems.

10. Identify the following components and describe how they are tested.
    i. controls
    ii. basic components
        - solenoids
        - relays
    iii. components and spools

11. Identify hydraulic systems used for all types of cranes.
    i. closed centre systems
    ii. open centre systems
    iii. speed-o-matic system (Link Belt)
    iv. hydraulically-powered (lattice boom cranes)
    v. independent systems
    vi. combined systems
    vii. independent clutch
    viii. independent steering
    ix. hydraulic systems (Grove Cranes)
        - boom lift system-hydraulic boom
        - boom extension system
        - swing system
        - hoist system
        - outrigger system
        - hydraulic counter-weight exterior system
    x. lattice boom crane upperworks
        - independent hydraulic system (gantry operation)
        - independent hydraulic system (boom operation)
        - independent hydrostatic drive system

Practical Requirements:

1. Perform routine maintenance and inspections for crane hydraulic systems:
    i. safety practices on a hydraulic system
    ii. general safety precautions
    iii. cleanliness and inspection
    iv. reservoir inspection
    v. inspection for leaks
    vi. leakdown
        - outrigger
        - boom hoist cylinders
        - boom extension cylinders

2. Test and replace defective components: controls, solenoids, relays and spools.

LC1260 Rigging Crane Operators

Learning Outcomes:

- Demonstrate knowledge of the procedures to use safety harnesses.
- Demonstrate knowledge of the procedures to perform rigging operations.

Course Duration: 60 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Describe the responsibilities of riggers.

2. Identify and describe the composition of wire rope.
   i. wire
   ii. strand
   iii. core (fibre or wire or strand)

3. Interpret and describe rope lay.
   i. regular
   ii. lang
   iii. right and left
   iv. alternate
   v. herringbone or twin strand
   vi. specialty ropes

4. Identify specialty ropes and how/where they are used including limitations.

5. Describe and interpret sizes, grades and construction of all types of rigging and hoisting ropes.

6. Identify and compare preformed vs. non-preformed types of ropes.

7. Identify and describe the fatigue and abrasion resistance of wire ropes.

8. Identify safety factors for:
    i. rigging slings (IWRC and anti-rotation)
    ii. running ropes
    iii. standing ropes
    iv. hoisting personnel

9. Calculate safe working loads.

10. Identify the classification group.

11. Identify and describe uses for non-rotation and rotating resistant ropes.

12. Describe proper installation procedures for all types of wire rope.

13. Explain the importance of lubricating and cleaning wire ropes.

14. Identify end fittings and connections and explain how they are installed.

15. Identify the minimum rope wraps on a drum that is to be maintained.

16. Identify grades of chain including.
    i. strength
    ii. inspection
    iii. care and use of

17. Describe reeving.

18. Determine the parts of line required.

19. Describe the effect of winch diameter for:
    i. multi-layer (wire rope)
    ii. line speed vs. torque

20. Compare the SWL of rope vs. line pull.

21. Describe the effect of sheave friction during a lift.

22. Identify the mechanical advantage of reeving.

23. Describe wire block reeving methods.
    i. lacing
    ii. square or angle
    iii. skip

24. Identify and describe types and configurations for slings including.
    i. wire rope
    ii. synthetic web
    iii. jacketed round synthetic
    iv. metal mesh
    v. chain
    vi. sling configurations
    vii. single vertical hitch
    viii. bridle hitch
    ix single and double basket hitch
    x. double wrap basket hitch
    xi. single and double choker hitch
    xii. double wrap choker hitch
    xiii. endless slings or grommet
    xiv. braided
    xv. sling angles
    xvi. safe working loads

25. Read and interpret manufacturer identification tags.

26. Describe rigging precautions when using synthetic and specialty slings.

27. Explain the importance of removing frayed, cut, damaged and worn equipment from service.

28. Describe rigging procedures and perform rigging calculations.

29. Determine load weights.

30. Determine the centre of gravity for various loads.

31. Determine tensions on sling legs.

32. Identify the hand signals used for hoisting operations.

Practical Requirements:

1. Plan rigging operations.

2. Calculate safe working loads and sling angles.

3. Calculate loads on equalizer beams.

4. Demonstrate proper signaling for hoisting procedures.

5. Demonstrate installation of multiple parts of line.
   i. lacing
   ii. reeving (square or angle/skip)

6. Demonstrate proper installation and procedures for all types of wire rope.

7. Inspect, use, handle and maintain wire rope.
   i. lubrication
   ii. cleaning

8. Install wire rope wedge socket end termination.

9. Demonstrate the use of:
   i. drums and winches
   ii. sheaves
   iii. hooks
   iv. rings, links and swivels
   v. shackles
   vi. eye bolts and lugs
   vii. turnbuckles
   viii come-a-long and chain hoist
   ix. spreader and equalizer beams
   x. crane blocks
   xi. wire rope blocks
   xii. snatch block
   xiii. block and tackle

xiv. wire rope clips

10. Assemble rigging in a safe and efficient manner.

11. Select appropriate rigging hardware for a given job.

12. Perform maintenance and properly store rigging.

13. Demonstrate proper rigging procedures and calculations.

14. Plan and demonstrate various rigging operations.

AP1101 Introduction to Apprenticeship

Learning Outcomes:

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define the following terms:
   i. apprenticeship
   ii. apprentice vs. registered apprentice
   iii. Journeyperson vs. Certified Journeyperson
   iv. Certificate of Apprenticeship
   v. Certificate of Qualification
   vi. Recognition of Prior Learning
   vii. dual certification

2. Explain the apprenticeship system in Newfoundland and Labrador and the roles and responsibilities of those involved.
   i. registered apprentice
   ii. training institution
   iii. employer
   iv. Journeyperson
   v. Department of Advanced Education and Skills
      - Industrial Training Section
      - Standards and Curriculum Section
   vi. Provincial Trade Advisory Committees
   vii. Provincial Apprenticeship and Certification Board

3. Identify the Conditions Governing Apprenticeship.

4. Describe the training and educational requirements.
   i. pre-employment (entry level) training
   ii. block release
   iii. on-the-job

5. Explain the steps in the registered apprenticeship process.
   i. criteria for eligibility
      - entrance requirements as per Conditions of Apprenticeship
      - employment
   ii. registration process
      - application requirements
   iii. Memorandum of Understanding
      - probation period
      - cancellation
   iv. Record of Occupational Progress (Logbook)
      - signing off skills
      - recording hours
      - updating PDO on progress
   v. class calls
      - schedule
      - EI Eligibility
      - Direct Entry
      - advanced level
   vi. Block Exams
   vii. progression
      - schedule
      - wage rates
   viii. cancellation of apprenticeship
   ix. Practical Examinations
   x. Provincial and Interprovincial examinations
   xi. certification
      - Certification of Apprenticeship
      - Certification of Qualification
      - Provincial certification
      - Interprovincial Red Seal Endorsement

6. Explain the Interprovincial Standards Red Seal Program.
   i. designated Red Seal trade
   ii. the National Occupational Analysis (NOA)
   iii. Interprovincial (IP) Red Seal Endorsement Examination
   iv. relationship of NOA to IP Examination
   v. qualification recognition and mobility

7. Identify the current financial incentives available to apprentices.

8. Explain the NL apprenticeship and trades certification division's out-of- province apprenticeship policy.

Practical Requirements:

1. Use the Provincial Apprenticeship and Trades Certification web site at www.gov.nl.ca/app to:
   i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
   ii. locate, download, and complete the Out of Province registration forms
      - Application for Apprenticeship (out of province)
      - Letter of Understanding (LOU)
      - Acceptance of Conditions Letter
   iii. locate, download, and complete the Work Experience Credits form
   iv. identify the locations of all Industrial Training offices
   v. locate and review the following learning resources relevant to the trade:
      - Study Guide
      - Exam Preparation Guide
      - Plan of Training

2. Use a logbook for this trade to:
   i. identify the hours for the trade (in-school and on-the-job)
   ii. identify the number of blocks
   iii. identify the courses in each block
   iv. identify the workplace skills to be completed and verified

3. Use the Red Seal Web site, http://www.red-seal.ca to retrieve the National Occupational Analyses (NOA) for this trade.
   i. identify the following components of the NOA:
      - Trends
      - Scope
      - Key Competencies
      - Blocks
      - Tasks
      - Subtasks
      - Pie Charts
      - Table of Specifications

AM1100 Math Essentials

Note: It is recommended that AM1100 be delivered in the first semester of the Entry Level training program.

Learning Outcomes:

- Demonstrate knowledge of the numeracy skills required to begin the 2nd level math course.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor should use trade specific examples to reinforce the course objectives

1. Use multiplication tables from memory.

2. Perform whole number operations.
   i. read, write, count, round off, add, subtract, multiply and divide whole numbers

3. Apply the order of operations in math problems.

4. Perform fraction and mixed number operations.
   i. read, write, add, subtract, multiply and divide fractions

5. Perform decimal operations.
   i. read, write, round off, add, subtract, multiply and divide decimals

6. Perform percent/decimal/fraction conversion and comparison.
   i. convert between fractions, decimals and percents

7. Perform percentage operations.
   i. read and write percentages
   ii. calculate base, rates and percentages

8. Perform ratio and proportion operations.
   i. use a ratio comparing two quantities with the same units
   ii. use a proportion comparing two ratios

9. Use the imperial measurement system in math problems.
   i. identify units of measurement for:
      - length
      - mass
      - area
      - volume
      - capacity

10. Use the metric measurement system in math problems.
    i. identify units of measurement for:
       - length
       - mass
       - area
       - volume
       - capacity

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

AM1340 Hoisting Math Fundamentals

Learning Outcomes:

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of solving mathematical word problems.
- Demonstrate knowledge of mathematical principles for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

Duration: 30 Hours

Pre-Requisite(s): AM1100

Objectives and Content:

The instructor is required to use trade specific examples to reinforce the course objectives.

1. Employ percent/decimal/fraction conversion and comparison in trade specific situations.

2. Apply ratios and proportions to trade specific problems.

3. Use the Imperial Measurement system in trade specific applications.

4. Use the Metric Measurement system in trade specific applications.

5. Complete Imperial/Metric conversions in trade specific situations.
   i. convert between imperial and metric measurements
   ii. convert to another unit within the same measurement system

6. Manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems, such as:
   i. right angle triangles
   ii. area
   iii. volume
   iv. perimeter

7. Perform calculations involving geometry that are relevant to the trade, such as:
   i. angle calculations
   ii. circle calculations

8. Use practical math skills to complete administrative trade tasks.
   i. material estimation
   ii. material costing
   iii. time & labour estimates
   iv. taxes & surcharges
   v. markup & projecting revenue

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

Note:

This course has been designated as NON-TRANSFERABLE to other trades programs, and NOT ELIGIBLE FOR PRIOR LEARNING ASSESSMENT. Students completing training in this trade program are required to complete this math course.

CM2160 Communication Essentials

Learning Outcomes:

- Demonstrate knowledge of the importance of well-developed writing skills in the workplace and in career development.
- Demonstrate knowledge of the purpose of various types of workplace correspondence.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of standard formats for letters and memos.
- Demonstrate knowledge of principles related to writing effective letters and memos.
- Demonstrate the ability to prepare and deliver an oral presentation.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.

Duration: 45 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify the principles for writing clear, concise, complete sentences and paragraphs which adhere to the conventions of grammar, punctuation, and mechanics.

2. Identify the principles of effective workplace writing.
   i. describe the value of well-developed writing skills to career success
   ii. discuss the importance of tone, and language or word choice in workplace communication, regardless of the circumstances
   iii. demonstrate an awareness of cultural differences when preparing workplace correspondence
   iv. describe the writing process as it applies to workplace communication
      - planning
      - writing

- editing/revising

v. identify the parts of a business letter and memo, and when each should be used in the workplace

vi. identify the standard formats for business letters and memos

vii. identify guidelines for writing sample letters and memos which convey:
- acknowledgment
- routine request
- routine response
- complaint
- refusal
- persuasive request
- letters of appeal

3. Identify types of informal workplace documents.

i. identify types & purposes of reports
- incident
- process
- progress

ii. identify common trade specific forms

iii. describe primary and secondary methods used to gather information

iv. discuss the importance of accuracy and completeness in reports and forms

4. Identify the elements of presentations used in the workplace.

i. identify presentation types
- impromptu
- informative
- demonstration
- persuasive

ii. identify the components of an effective presentation
- eye contact
- body language
- vocal qualities
- audience analysis
- multimedia tools
- keeping on topic

5. Demonstrate an understanding of interpersonal communications in the workplace.
    i. identify listening techniques
    ii. demonstrate an understanding of group dynamics
    iii. describe the importance of contributing information and expertise in the workplace
    iv. describe the importance of respectful and open communication in the workplace
    v. identify methods to accept and provide feedback in a constructive and considerate manner
    vi. explain the role of conflict in a group to reach solutions

6. Identify acceptable workplace uses of communication technologies.
    i. cell / Smart Phone etiquette
    ii. voice mail
    iii. e-mail
    iv. teleconferencing / videoconferencing for meetings and interviews
    v. social networking
    vi. other emerging technologies

Practical Requirements:

1. Write well-developed, coherent, unified paragraphs.

2. Write sample letters and memos.

3. Write one short informal report.

4. Complete a selection of at least 3 trade-related forms.

5. Deliver an effective oral presentation.

SD1760 Workplace Essentials

Note: It is recommended that SD1760 be delivered in the second half of the Entry Level training program.

Learning Outcomes:

- Demonstrate knowledge of workplace essentials in the areas of meetings, unions, workers compensation, workers' rights, and human rights.
- Demonstrate knowledge of good customer service practices.
- Demonstrate knowledge of effective job search techniques.

Duration: 45 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify common practices related to workplace meetings.
    i. identify and discuss meeting format and preparation required for a meeting
    ii. explain the purpose of an agenda
    iii. explain the expected roles, responsibilities, and etiquette of meeting participants

2. Define unions and identify their role in the workplace.
    i. identify the purpose of unions
    ii. identify a common union structure
    iii. identify the function of unions in this trade

3. Demonstrate an understanding of the Worker's Compensation process.
    i. describe the aims, objectives, regulations and benefits of the Workplace Health, Safety and Compensation Commission
    ii. explain the role of the Workers Advisor
    iii. explain the internal review process

4. Demonstrate an understanding of workers' rights.
    i. define labour standards
    ii. identify regulations, including:
        - hours of work & overtime
        - termination of employment
        - minimum wages & allowable deductions
        - statutory holidays, vacation time, and vacation pay

5. Demonstrate an understanding of Human Rights issues.
    i. examine the Human Rights Code and explain the role of the Human Rights Commission
    ii. define harassment in various forms and identify strategies for prevention
        - direct
        - systemic
        - adverse effect
    iii. identify gender and stereotyping issues in the workplace
    iv. define basic concepts and terms related to workplace diversity including age, race, culture, religion, socio-economic status, and sexual orientation

6. Demonstrate an understanding of quality customer service.
    i. explain why quality service is important
    ii. identify barriers to quality customer service
    iii. identify customer needs & common methods for meeting them
    iv. identify and discuss the characteristics & importance of a positive attitude
    v. identify the importance of demonstrating good communication skills including body language, listening, questioning, and when using electronic communication devices
    vi. identify techniques for interacting with challenging customers to address complaints and resolve conflict

7. Demonstrate an understanding of effective job search techniques.
    i. identify and explain employment trends, opportunities, and sources of employment
    ii. identify and discuss essential skills for the trades as outlined by Human Resources and Skills Development Canada
    iii. review job ads and identify the importance of fitting qualifications to job requirements
    iv. identify the characteristics of effective resumes, the types of resumes, and principles of resume formatting
    v. identify the characteristics of an effective cover letter
    vi. identify the components of a portfolio, and discuss the value of establishing and maintaining a personal portfolio
    vii. identify the common characteristics of the job interview process:
        - pre-interview preparation
        - interview conduct
        - post-interview follow up

Practical Requirements:

1. Create a resume.

2. Create a cover letter.

3. Participate in a mock job interview.

MC1060 Computer Essentials

Learning Outcomes:

- Demonstrate knowledge of computer systems and their operation.
- Demonstrate knowledge of popular software packages and their applications.
- Demonstrate knowledge of security issues related to computers.

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify the major external components of a microcomputer system.
   i. input devices
   ii. output devices
   iii. central control unit

2. Use operating system software.
   i. start and quit a program
   ii. use the help function
   iii. use the find function
   iv. maximize and minimize a window
   v. use the task bar
   vi. adjust desktop settings such as screen savers, screen resolution, and backgrounds
   vii. shut down a computer

3. Perform file management commands.
   i. create folders
   ii. copy files and folders
   iii. move files and folders
   iv. rename files and folders

v. delete files and folders

4. Use word processing software to create documents.
   i. enter text
   ii. indent and tab text
   iii. change text attributes (bold, underline, font, etc.)
   iv. change layout format (margins, alignment, line spacing)
   v. spell check and proofread
   vi. edit text
   vii. save document
   viii. print document
   ix. close document
   x. retrieve documents

5. Use spreadsheet software to create spreadsheets.
   i. enter data in cells
   ii. create formulas to add, subtract, multiply and divide
   iii. save spreadsheet
   iv. print spreadsheet
   v. close spreadsheet
   vi. retrieve spreadsheet

6. Access the Internet.
   i. access websites using the world wide web(www)
   ii. identify examples of web browsers
   iii. use search engines with common searching techniques
   iv. describe security issues

7. Use electronic mail.
   i. describe e-mail etiquette
      - grammar and punctuation
      - privacy and legal issues when sharing and forwarding e-mail
      - work appropriate content
      - awareness of employer policies
   ii. manage e-mail using the inbox, sent, and deleted folders
   iii. send an e-mail message with attachment(s)
   iv. print e-mail

Practical Requirements:

None.

TC1100 Introduction to Tower Cranes

Learning Outcomes:

- Demonstrate knowledge of tower cranes, their characteristics and applications.
- Demonstrate knowledge of the procedures used to configure tower cranes and their components.

Duration: 3 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with tower cranes.

2. Identify hazards and describe safe work practices pertaining to tower cranes.

3. Identify types of tower cranes and describe their characteristics and applications.
   i. hammerhead
   ii. luffing
   iii. self-erecting
   iv. stationary
   v. traveling
   vi. climbing

4. Identify types of tower crane jibs and describe their characteristics and applications.
   i. hammerhead/fixed
   ii. luffing

5. Identify types of tower crane masts and describe their characteristics and applications.
   i. Mono
   ii. Transitional
   iii. inner/outer
   iv. top/bottom climbers

v. telescopic

6. Identify types of tower crane bases and describe their characteristics and applications.
   i. base slab
   ii. rail mounted
   iii. crawler mounted
   iv. truck mounted
   v. outrigger
   vi. cruciform

7. Describe the procedures used to configure tower cranes and their components.

8. Describe the procedures used to inspect and maintain tower cranes.

Practical Requirements:

None.

TC1110 Tower Crane Components

Learning Outcomes:

- Demonstrate knowledge of tower crane components, their characteristics and applications.
- Demonstrate knowledge of procedures used to troubleshoot, maintain, inspect and store tower crane components.

Duration: 30 Hours

Pre-Requisite(s): TC1100

Objectives and Content:

1. Define terminology associated with tower crane components.
   i. hammerhead
   ii. luffing
   iii. self-erecting

2. Identify hazards and describe safe work practices pertaining to tower crane components.

3. Interpret codes, standards and regulations pertaining tower crane components.
   i. manufacturers' specifications
   ii. CSA Z248
   iii. jurisdictional regulations

4. Identify types of tower crane components and describe their characteristics and applications.
   i. structural
   ii. support
   iii. track or travel
   iv. cab
   v. safety/access

5. Describe the procedures used to inspect connections of tower crane components and their accessories.

6. Describe the procedures used to troubleshoot tower crane components and accessories for various configurations.

7. Describe the procedures used to inspect, maintain and store tower crane components and their accessories.

Practical Requirements:

1. Locate and identify tower crane components.

2. Complete an inspection of a tower crane.
   i. pre-operational
   ii. post-operational

3 Maintain tower crane components.

4. Store tower crane components.

TC1120 Access Equipment

Learning Outcomes:

- Demonstrate knowledge of access equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of procedures used to inspect and maintain access equipment.

Duration: 30 Hours

Pre-Requisite(s): TC1100

Objectives and Content:

1. Define terminology associated with access equipment.

2. Identify hazards and describe safe work practices pertaining to access equipment.

3. Identify codes, standards and regulations pertaining to access equipment.
   i. training and certification requirements
   ii. jurisdictional requirements

4. Identify types of access equipment and describe their characteristics and applications.
   i. ladders
   ii. catwalks
   iii. scaffolding

5. Identify types of fall protection and fall arrest equipment and describe their applications and procedures for use.

6. Describe the procedures used to erect and dismantle access equipment.
   i. manufacturers' specifications
   ii. professional engineer specifications

7. Describe the procedures used to inspect and maintain access equipment.
   i. manufacturers' specifications

Practical Requirements:

1. Perform proper use of access equipment.

TC1130 Electrical Systems

Learning Outcomes:

- Demonstrate knowledge of electrical systems, their purpose and operation.
- Demonstrate knowledge of electrical system components, their characteristics and applications.
- Demonstrate knowledge of procedures used to inspect, maintain and troubleshoot electrical systems and their components.

Duration: 15 Hours

Pre-Requisite(s): TC1110, TC1120

Objectives and Content:

1. Define terminology associated with electrical systems.

2. Identify hazards and describe safe work practices pertaining to electrical systems and their components.

3. Identify tools and equipment relating to electrical systems and components and describe their applications and procedures for use.

4. Interpret codes, standards and regulations pertaining to electrical systems.
   i. training and certification requirements
   ii. manufacturers' specifications

5. Identify types of electrical systems and describe their purpose and operation.
   i. digital
   ii. analog
   iii. control voltage
   iv. supply voltage

6. Identify electrical system components and describe their applications.
   i. limit switches
   ii. grounding

iii. supply cables
iv. disconnect switches
v. strain relief devices (power cable supports)
vi. power supply
vii. motors
viii. digital drives

7. Describe the procedures used to troubleshoot electrical systems and their components.

8. Describe the procedures used to maintain electrical systems and their components.

9. Describe the procedures used to inspect electrical systems and their components.

Practical Requirements:

1. Inspect, maintain and troubleshoot electrical systems and their components.

TC1140 Mechanical Systems

Learning Outcomes:

- Demonstrate knowledge of mechanical systems, their purpose and operation.
- Demonstrate knowledge of mechanical system components, their characteristics and applications.
- Demonstrate knowledge of procedures used to inspect, maintain and troubleshoot mechanical systems and their components.

Duration: 15 Hours

Pre-Requisite(s): TC1110, TC1120

Objectives and Content:

1. Define terminology associated with mechanical systems.

2. Identify hazards and describe safe work practices pertaining to mechanical systems and their components.

3. Identify tools and equipment relating to mechanical systems and components and describe their applications and procedures for use.

4. Interpret codes, standards and regulations pertaining to mechanical systems.

5. Identify types of mechanical systems and describe their purpose and operation.

6. Identify mechanical system components and describe their applications.
   i. winches
   ii. sheaves
   iii. slewing drives
   iv. brakes
   v. gear boxes
   vi. mechanical safety devices
   vii. trolley components

7. Describe the procedures used to troubleshoot mechanical systems and their components.

8. Describe the procedures used to maintain mechanical systems and their components.
   i. lubricate
   ii. torque bolts
   iii. mark bolts

9. Describe the procedures used to inspect mechanical systems and their components.

Practical Requirements:

1. Inspect, maintain and troubleshoot mechanical systems and their components.

TC1150 Tower Crane Load Charts

Learning Outcomes:

- Demonstrate knowledge of tower crane load charts, their characteristics and applications.
- Demonstrate knowledge of tower crane capacity, tower crane component capacity and working radius for lifting operations.

Duration: 60 Hours

Pre-Requisite(s): TC1130, TC1140

Objectives and Content:

1. Define terminology associated with tower crane load charts.

2. Explain the principles of tower crane load charts.
   i. CSA Z248
   ii. jurisdictional regulations

3. Identify parts of a tower crane load chart and describe their characteristics and applications.
   i. notes
   ii. capacity charts
   iii. range diagram
   iv. technical data
   v. factors reducing capacity

4. Interpret data from tower crane load charts required to plan lifts.
   i. reeving requirements
   ii. parts of line
   iii. quadrants of operation
   iv. capacity reductions for various configurations

5. Identify factors (i.e. weather) that influence tower crane capacity in lifting operations and describe their impact.
   i. size and/or weight of load
   ii. environmental conditions

Practical Requirements:

1. Interpret load chart data and calculate tower crane capacities for various configurations.

TC1160 Assembly and Disassembly

Learning Outcomes:

- Demonstrate knowledge of tower cranes and their associated components.
- Demonstrate knowledge of the procedures used for the assembly and disassembly of tower cranes and their components.

Duration: 30 Hours

Pre-Requisite(s): TC1150

Objectives and Content:

1. Define terminology associated with the assembly and disassembly of tower cranes.

2. Identify hazards and describe safe work practices pertaining to the assembly and disassembly of tower cranes.

3. Identify tools and equipment relating to the assembly and disassembly of tower cranes and describe their applications and procedures for use.

4. Interpret codes, standards and regulations pertaining to the assembly and disassembly of tower cranes.
   i. permits

5. Interpret charts, drawings and specifications relating to the assembly and disassembly of tower cranes.
   i. manufacturers' specifications
   ii. professional engineer specifications

6. Identify tower crane components requiring assembly and disassembly.
   i. mast/tower
   ii. boom/trolley
   iii. counter-jib
   iv. counter-weight

v. apex/tower top

7. Describe the procedures used to assemble tower cranes and their components.

8. Describe the procedures used to disassemble tower cranes and their components.

9. Describe the procedures used for the assembly and disassembly of specialty equipment and their attachments.

10. Describe the procedures used to transport tower crane components and self-erecting tower cranes.

Practical Requirements:

1. Perform a function test.

2. Perform a load test.

TC1170 Pre-lift Planning

Learning Outcomes:

- Demonstrate knowledge of the steps required for pre-lift activities.
- Demonstrate knowledge of procedures used to perform pre-lift (warm-up) activities.
- Demonstrate knowledge of the procedures used to prepare worksite for tower crane operations.

Duration: 6 Hours

Pre-Requisite(s): TC1160

Objectives and Content:

1. Define terminology associated with pre-lift planning.

2. Identify hazards and describe safe work practices pertaining to pre-lift planning.

3. Identify tools and equipment relating to pre-lift planning and activities and describe their applications and procedures for use.

4. Interpret codes, standards and regulations pertaining to pre-lift planning.
   i. jurisdictional requirements
   ii. job site/company policies

5. Interpret information pertaining to lifting operations found on drawings and specifications.
   i. lift plans
   ii. manufacturers' specifications

6. Identify the considerations and requirements for completing pre-lift planning.
   i. risk assessment (job site hazard analysis)
   ii. site assessment
      - site/soil conditions

- crane access
- obstructions
- electrical hazards

iii. worksite preparation

7. Describe the procedures used to prepare worksite for crane operations.

8. Describe the procedures used to perform final site inspection.

Practical Requirements.

None.

TC1180 Climbing and Lowering

Learning Outcomes:

- Demonstrate knowledge of climbing and lowering components and their applications.
- Demonstrate knowledge of the procedures used for climbing and lowering operations.

Duration: 6 Hours

Pre-Requisite(s): TC1170

Objectives and Content:

1. Define terminology associated with climbing and lowering.

2. Identify hazards and describe safe work practices pertaining to climbing and lowering.

3. Interpret codes, standards and regulations pertaining to climbing and lowering.

4. Interpret charts, drawings and specifications relating to climbing and lowering.

5. Identify types of climbing and lowering components and describe their applications.

6. Identify the considerations and requirements for climbing and lowering tower cranes according to manufacturer's specifications..

7. Describe the procedures used to perform bottom-climbing operations.

8. Describe the procedures used to perform top-climbing operations.

9. Describe the procedures used to perform lowering operations

Practical Requirements.

None.

TC1190 Specialty Crane Operations

Learning Outcomes:

- Demonstrate knowledge of specialty crane operations, their characteristics and applications.
- Demonstrate knowledge of the procedures used to perform specialty crane operations.

Duration: 6 Hours

Pre-Requisite(s): TC1170

Objectives and Content:

1. Define terminology associated with specialty crane operations.

2. Identify hazards and describe safe work practices pertaining to specialty crane operations.

3. Interpret codes, standards and regulations pertaining to specialty crane operations.

4. Interpret charts, drawings and specifications pertaining to specialty crane operations.

5. Identify specialty crane operations and describe their characteristics and applications.
   i. multi-crane lifts
   ii. hoisting personnel
   iii. evacuation procedures
   iv. critical capacity lifts
   v. professional engineer specifications
   vi. travels crane

6. Describe the procedures used to attach equipment to cranes for specialty operations.

7. Describe the procedures used to perform specialty crane operations.

Practical Requirements.

None.

TC1200 Tower Crane Profiles

Learning Outcomes:

- Demonstrate knowledge of hammer head, luffing jib and self-erecting tower cranes, their applications and operation.
- Demonstrate knowledge of the procedures used to operate hammer head, luffing jib and self-erecting tower cranes and their attachments.

Duration: 9 Hours

Pre-Requisite(s): TC1170

Objectives and Content:

1. Define terminology associated with hammer head, luffing jib and self-erecting tower crane operations.

2. Identify hazards and describe safe work practices pertaining to hammer head, luffing jib and self-erecting tower crane operations.
   i. personnel
   ii. equipment
   iii. environmental

3. Interpret codes, standards and regulations pertaining to hammer head, luffing jib and self-erecting tower crane operations.
   i. site-specific
   ii. jurisdictional regulations

4. Interpret charts, drawings and specifications pertaining to hammer head, luffing jib and self-erecting tower crane operations.
   i. lift plans
   ii. manufacturers' specifications

5. Describe the procedures used to operate hammer head, luffing jib and self-erecting tower cranes and their attachments.

Practical Requirements.

None.

D. Conditions Governing Apprenticeship Training

1.0 General

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the *Apprenticeship Training and Certification Act (1999)*. If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

2.0 Entrance Requirements

2.1 Entry into the occupation as an apprentice requires:

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

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 a particular Plan of Training. Mature students, at the discretion of the Director of Apprenticeship and Trades Certification, 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 Apprenticeship and Trades Certification, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 An Application for Apprenticeship form must be duly completed along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of

an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.

2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

3.0 Probationary Period

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

4.0 Termination of a Memorandum of Understanding

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB, such as that stated inSection14.

5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria

Progression Schedule

Tower Crane Operator-5400 Hours			
APPRENTICESHIP LEVEL AND WAGES			
Year	Wage Rate At This Level	Requirements for progression to next level of apprenticeship	When requirements are met, the apprentice will progress to…
1st	60%	▪ Completion of Block 1 training ▪ Pass Block 1 Exam ▪ Minimum 1800 hours of combined relevant work experience and training	2nd Year
2nd	75%	▪ Completion of Block 1 training ▪ Pass Block 1 Exam ▪ Minimum 3600 hours of combined relevant work experience and training	3rd Year
3rd	90%	▪ Completion of Block 1 training ▪ Pass Block 1 Exam ▪ Minimum 5400 hours of combined relevant work experience and training ▪ Sign-off of all workplace skills in the apprentice logbook ▪ Pass certification exam	Journeyperson Certification

Wage Rates

- Rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice.
- Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order.
- Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace.
- Employers are free to pay wage rates above the minimums specified.

Block Exams

- This program may **not** currently contain Block Exams, in which case this requirement will be waived until such time as Block Exams are available.

Direct Entry Apprentice

- Must complete Block 1 courses through PLA and / or in school training.
- Block 1 training is to be completed via class calls; up to 16 weeks of training per calendar year.

6.0 Tools

Apprentices shall be required to obtain their own hand tools applicable for the designated occupation of registration or tools as specified by the PACB.

7.0 Periodic Examinations and Evaluation

7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her apprenticeship level and rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Apprenticeship and Trades Certification 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 PACB may shorten the term of apprenticeship and advance the date of completion accordingly.

7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

8.0 Granting of Certificates of Apprenticeship

Upon the successful completion of apprenticeship, the PACB 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 Apprenticeship and Trades Certification shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

11.0 Ratio of Apprentices to Journeypersons

Under normal practice, the ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed. Other ratio arrangements would be determined and approved by the PACB.

12.0 Relationship to a Collective Bargaining Agreement

Where applicable in Section 5 of these conditions, Collective Agreements take precedence.

13.0 Amendments to a Plan of Apprenticeship Training

A Plan of Training may be amended at any time by the PACB.

14.0 Employment, Re-Employment and Training Requirements

14.1 The Plan of Training requires apprentices to regularly attend their place of employment.

14.2 The Plan of Training requires apprentices to attend training for that occupation as prescribed by the PACB.

14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire

program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.

14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or qualifying to receive a class call to training as a registered Trade Qualifier. Cancellation must be mutually agreed upon by the employer and the apprentice.

14.5 An employer shall ensure that each apprentice is under the direct supervision of an approved journeyperson supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyperson with respect to the task, activity or function that is being supervised.

14.6 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 first opportunity to be hired before another is hired.

14.7 The employer will permit each apprentice to attend training programs as prescribed by the PACB.

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

15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Advanced Education and Skills within 30 days of the decision.

E. Requirements for Red Seal Endorsement

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.

2. Successful completion of all required courses in the program.

3. A combination of training from an approved training program and suitable work experience totaling 5400 hours.

4. Completion of a National Red Seal examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

F. Roles and Responsibilities of Stakeholders in the Apprenticeship Process

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

The Apprentice:

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

The Employer:

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Apprenticeship and Trades Certification Division and apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.
- ensures a certified journeyperson is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Advanced Education and Skills.

The Training Institution:

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

The Apprenticeship and Trades Certification Division:

- establishes and maintains program advisory committees under the direction of the PACB.

- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.

- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.

- ensures all apprentices are appropriately registered and records are maintained as required.

- schedules all necessary technical training periods for apprentices to complete requirements for certification.

- administers block, provincial and interprovincial examinations.

The Provincial Apprenticeship and Certification Board:

- sets policies to ensure the provisions of the *Apprenticeship and Certification Act (1999)* are implemented.

- ensures advisory and examination committees are established and maintained.

- accredits institutions to deliver apprenticeship training programs.

- designates occupations for apprenticeship training and/or certification.