

Apprenticeship and Industry Training

Crane and Hoisting Equipment Operator- Mobile Crane Operator/Boom Truck Operator Curriculum Guide

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Apprenticeship
and Industry
Training

ALBERTA ADVANCED EDUCATION

Crane and Hoisting Equipment Operator –
Mobile Crane Operator/Boom Truck Operator: apprenticeship education program curriculum guide

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Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding a sponsor. Sponsors guide apprentices, and support on-the-job learning through provision of mentorship. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyman or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution (PSI) – usually a college or technical institute.

To receive their post-secondary credential, apprentices must learn theory and skills, and they must pass examinations. Criteria for the program—including the content and delivery of technical training—are developed and updated by the Registrar.

The graduate of the Mobile Crane/Boom Truck apprenticeship program is an individual who will be able to:

- maintain tools and equipment.
- demonstrate safe work practices.
- recognize and mitigate hazardous conditions related to boom truck/mobile crane operation.
- interpret and apply load charts, manufacturers manual and other related documentation.
- apply reference use, management and organizational skills.
- set-up boom truck/mobile crane for a lift.
- rig the load for lifting.
- hoist as per signals.
- operate the boom truck/mobile crane to lift and set the load
- prepare the boom truck/mobile crane for travel.
- understand the fundamentals of operating a small business.
- perform assigned tasks in accordance with quality and production standards required by industry.

Apprenticeship and Industry Training System

Alberta's apprenticeship education programs are supported by industry stakeholders that ensures a highly skilled, internationally competitive workforce in the province. The Registrar establishes the educational standards and provides direction to the system supported by industry and the PSI's. The Ministry of Advanced Education provides the legislative framework and administrative support for the apprenticeship and industry training system.

Special thanks are offered to the following industry members who contributed to the development of the standard:

Mr. S. FryerEdmonton
Mr. S. Gibson Ft. Saskatchewan
Mr. J. Kidd Ft. McMurray
Mr. D. Secord Spruce Grove
Mr. T. Tessier Calgary
Mr. M. Iliffe.....Devon
Mr. D. Stanley.....Calgary
Mr. M. StokesBeaumont

Alberta Government

Alberta Advanced Education works with industry, sponsor and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and sponsors
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprentice Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, sponsors, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Occupational Health and Safety

Persons engaged in, or supporting an individual in an experiential learning environment are often exposed to more worksite hazards than in other forms of traditional post-secondary education and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety-OHS (a division of Alberta Labour and Immigration) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.alberta.ca/occupational-health-safety.aspx

Technical Training

Apprenticeship technical training is delivered by the PSI's throughout Alberta. The PSI's are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All PSI's place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all professions.

The PSI's work with industry and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship education programs across the province. They develop curriculum from the curriculum guides established by the Registrar in consultation with the PSI's and industry and provide the technical training to apprentices.

The following PSI's deliver Crane and Hoisting Equipment Operator – Mobile Crane Operator trade apprenticeship training/Boom Truck Operator trade apprenticeship training:

Northern Alberta Institute of Technology (NAIT)	Northern Lakes College
Southern Alberta Institute of Technology (SAIT)	
Keyano College	

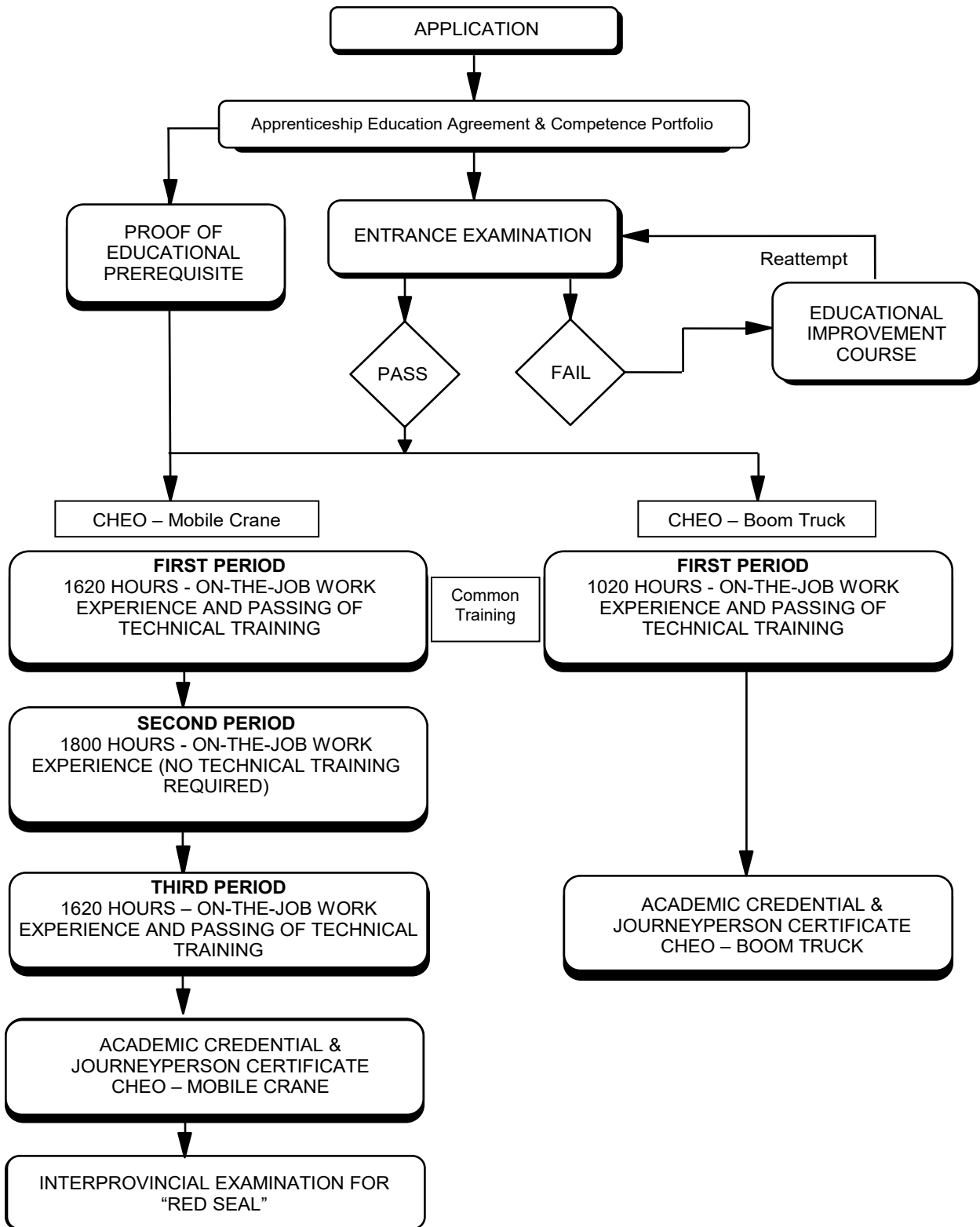
Procedures for Recommending Revisions to the Curriculum Guide

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Registrar of Apprenticeship Education Programs
c/o Apprenticeship Delivery and Industry Support Services
Apprenticeship Delivery and Industry Support
Advanced Education
19th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used.

Apprenticeship Route toward Academic Credential



**Crane and Hoisting Equipment Operator-
Mobile Crane Operator / Boom Truck Operator
FIRST PERIOD – Common Core
(6 Weeks 30 Hours per Week – Total of 180 Hours)**

SECTION ONE

**STANDARD WORKPLACE
SAFETY, MATERIALS AND
TOOLS**
14%



A

Safety Legislation,
Regulations & Industry Policy
in the Trades
12%

B

Climbing, Lifting, Rigging and
Hoisting
21%

C

Hazardous Materials and
Fire Protection
13%

SECTION TWO

**INTRODUCTION TO BOOM
TRUCKS AND CRANES, CODES
AND DOCUMENTATION**
12%



D

Apprenticeship Education
Training Program
4%

E

Codes and Regulations
50%

A

Types of Boom Trucks
10%

B

Boom Truck Components
9%

C

Types of Mobile Cranes
9%

D

Mobile Crane Components
18%

E

Hoisting Equipment
Maintenance
45%

F

Documentation
9%

SECTION THREE

**RIGGING EQUIPMENT AND
PROCEDURES**
22%



A

Types of Slings
5%

B

Rigging Hardware and
Accessories
5%

C

Rigging Calculations
45%

D

Rigging Procedures
15%

E

Crane Signals and
Communication
30%

SECTION FOUR

**LOAD CHART READING AND
INTERPRETATION**
17%



A

Load Charts
100%

SECTION FIVE

EQUIPMENT OPERATION
22%



A

Equipment Transportation
5%

B

Site Preparation
5%

C

Loading and Unloading
Equipment
5%

D

Assembly and Disassembly
of Hoisting Equipment
8%

E

Equipment Set Up
30%

F

Principles of Operation
5%

G

Lift Planning
15%

H

Lift Operations
25%

I

Leaving Crane Unattended
2%

SECTION SIX

**SPECIALTY LIFTS AND
WORKPLACE COACHING**

13%



A

Multi-Crane Lifts

42%

B

Personnel Baskets

25%

C

New Technology

21%

D

Workplace Coaching Skills

12%

**THIRD PERIOD – Mobile Crane Operator
(6 Weeks 30 Hours per Week – Total of 180 Hours)**

SECTION ONE

LATTICE BOOM CRANES 12%	⇒	A	B	C
		Types of Lattice Boom Cranes 19%	Lattice Boom Components 27%	Lattice Boom Inspection and Maintenance 27%
		D		
		Mobile Telescopic Cranes 27%		

SECTION TWO

CRANE ATTACHMENTS AND CRANE ASSEMBLY 19%	⇒	A	B	C
		Jibs 9%	Heavy Lift Attachments 18%	Specialty Accessories 6%
		D	E	F
		Site Preparation 18%	Loading and Unloading Cranes and Components 19%	Crane Assembly and Disassembly 30%

SECTION THREE

ADVANCED RIGGING 18%	⇒	A	B	C
		Specialty Rigging Equipment 19%	Advanced Rigging Procedures 18%	Advanced Rigging Calculations 63%

SECTION FOUR

ADVANCED LIFT PLANNING AND OPERATION 33%	⇒	A	B	C
		Critical Lift Planning 16%	Multi-Crane Lifts 42%	Single Crane Operations 42%

SECTION FIVE

LOAD CHART, LIFTING OPERATIONS, RED SEAL 18%	⇒	A	B	C
		Advanced Load Chart Interpreting 76%	Lift Dynamics 18%	Interprovincial Standards Red Seal Program 6%

**FIRST PERIOD TECHNICAL TRAINING – COMMON CORE
CRANE AND HOISTING EQUIPMENT OPERATOR – MOBILE CRANE OPERATOR TRADE/
BOOM TRUCK OPERATOR TRADE
CURRICULUM GUIDE**

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....STANDARD WORKPLACE SAFETY, MATERIALS & TOOLS..... 14%

A. Safety Legislation, Regulations & Industry Policy in the Trades 12%

Outcome: *Apply legislation, regulations and practices ensuring safe work in this trade.*

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the sponsor's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of worker and sponsors to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of sponsors and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting..... 21%

Outcome: *Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.*

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

C. Hazardous Materials & Fire Protection 13%

Outcome: *Apply industry standard practices for hazardous materials and fire protection in this trade.*

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.
4. Describe venting procedures when working with hazardous materials.
5. Describe hazards, classes, procedures and equipment related to fire protection.

D. Apprenticeship Education Training Program4%**Outcome: *Manage an apprenticeship to earn journeyperson certification.***

1. Describe the contractual responsibilities of the apprentice, employer and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the apprentice competency portfolio.
3. Describe the procedure for changing sponsors during an active apprenticeship.
4. Describe the purpose of the curriculum guide.
5. Describe the procedure for progressing through an apprenticeship.
6. Describe advancement opportunities in this trade.

E. Codes and Regulations..... 50%**Outcome: *Interpret codes and regulations.***

1. Explain Alberta's trade regulations for the crane and hoisting equipment operator trade.
2. Explain transportation rules and regulations.
3. Identify the sections of Occupational Health and Safety code that apply to hoisting equipment.
4. Interpret codes and standards for hoisting equipment.

SECTION TWO: INTRODUCTION TO BOOM TRUCKS AND CRANES 12%**A. Types of Boom Trucks 10%****Outcome: *Identify the structural and operational characteristics of boom trucks.***

1. Describe fixed station telescopic boom trucks.
2. Describe swing cab telescopic boom trucks.
3. Describe articulating boom trucks.

B. Boom Truck Components.....9%**Outcome: *Describe boom truck components.***

1. Describe the truck chassis.
2. Describe outriggers and stabilizers.
3. Describe the upperworks of a boom truck.

C. Types of Mobile Crane9%**Outcome: *Identify the structural and operational characteristics of mobile cranes.***

1. Describe carry deck cranes.
2. Describe rough terrain cranes.
3. Describe all terrain cranes.
4. Describe truck mounted cranes.
5. Describe crawler mounted cranes.
6. Describe lattice boom cranes.

D. Mobile Crane Components 18%

Outcome: Describe mobile crane components.

1. Describe wheeled carriers.
2. Describe crawler carriers.
3. Describe upperworks of mobile cranes.
4. Describe the composition and characteristics of wire rope.

E. Hoisting Equipment Maintenance..... 45%

Outcome: Maintain hoisting equipment.

1. Describe tools used to assemble and maintain hoisting equipment.
2. Identify maintenance on engines.
3. Identify maintenance on hydraulic systems.
4. Identify maintenance on air systems.
5. Identify maintenance on mechanical components and structures.
6. Identify maintenance on electrical systems.
7. Describe the types and characteristics of lubricant.
8. Identify the lubrication points on each components.

F. Documentation9%

Outcome: Complete documentation.

1. Complete a daily crane log book.
2. Complete maintenance request form.
3. Complete a hazard assessment.

SECTION THREE: RIGGING EQUIPMENT AND PROCEDURES 22%

A. Types of Slings5%

Outcome: Describe the types and functions of slings.

1. Describe slings used for rigging loads.
2. Describe Working Load Limits (WLL) for slings.
3. Interpret codes for slings and accessories.
4. Describe rigging configurations.
5. Describe the inspection of slings.
6. Describe rejection criteria for slings.
7. Describe the storage and maintenance of slings.

B. Rigging Hardware and Accessories5%

Outcome: *Describe types and functions of rigging hardware and accessories.*

1. Describe the use of rigging hardware.
2. Describe the use of rigging accessories.

C. Rigging Calculations 45%

Outcome: *Calculate rigging capacities.*

1. Define capacities for configurations.
2. Determine capacity reducing factors.

D. Rigging Procedures 15%

Outcome: *Rig loads.*

1. Explain characteristics of a load.
2. Determine center of gravity of the load.
3. Determine load weight.
4. Determine rigging configuration.
5. Rig the load.

E. Crane Signals and Communication 30%

Outcome: *Signal the crane.*

1. Perform crane hand signals.
2. Perform verbal signals.

SECTION FOUR: LOAD CHART READING AND INTERPRETATION 17%

A. Load Charts 100%

Outcome: *Interpret load charts for hoisting equipment.*

1. Determine gross and net load.
2. Determine gross and net capacities.
3. Determine percentage of gross capacity.
4. Perform load chart calculations.
5. Interpret range diagrams.
6. Analyze an engineered lift plan.
7. Define the parameters of a lift.

SECTION FIVE:..... EQUIPMENT OPERATION 22%

A. Equipment Transportation.....5%

Outcome: *Prepare crane for travel on public roads and site.*

1. Explain transportation regulations for hoisting equipment in Alberta.
2. Determine manufacturer’s transportation procedures.

B. Site Preparation5%

Outcome: *Prepare site for hoisting equipment.*

1. Recognize ground site conditions.
2. Identify site hazards (powerlines, underground utilities, buildings).
3. Calculate ground bearing pressure.
4. Determine space requirements for assembly and disassembly.
5. Determine space requirements for lifting operations.

C. Loading and Unloading Hoisting Equipment5%

Outcome: *Describe loading and unloading hoisting equipment.*

1. Determine orientation of the crane on the trailer.
2. Determine crane configuration.
3. Describe loading and unloading procedures.
4. Describe crane and component tie down procedures.

D. Assembly and Disassembly of Hoisting Equipment8%

Outcome: *Configure hoisting equipment components.*

1. Identify crane components.
2. Describe the function of crane components.
3. Describe the assembly of a jib to manufactures specifications.
4. Demonstrate wire rope block reeving methods.
5. Perform a pre-operational inspection.

E. Equipment Set-Up 30%

Outcome: *Set-up hoisting equipment.*

1. Perform pre-operational inspection.
2. Set-up and level hoisting equipment.
3. Configure the hoisting equipment.
4. Function test all controls and limit switches.

F. Principles of Operation5%

Outcome: *Describe the principles of operation.*

1. Describe the principles of leverage.
2. Describe load moment.

- 3. Explain center of gravity.
- 4. Explain the mechanical advantage reeving.
- 5. Describe stability versus structural capacity.
- 6. Describe quadrants of operation.
- 7. Describe dynamic and static loading.
- 8. Describe the effect of the load on the hoisting equipment.
- 9. Describe the effects of various forces on the hoisting equipment.

G. Lift Planning 15%

Outcome: Create a lift plan.

- 1. Determine load weight.
- 2. Perform site measurements.
- 3. Determine hoisting equipment configuration for the lift.
- 4. Determine load radius.
- 5. Complete load chart calculations.
- 6. Complete a lift plan drawing.
- 7. Determine percentage of capacity.
- 8. Explain a critical lift.

H. Lifting Operations 25%

Outcome: Operate hoisting equipment.

- 1. Conduct lifting operations as per configuration on outriggers.
- 2. Explain a pick and carry operation.
- 3. Describe a multi-crane lift.
- 4. Describe hoisting personnel.

I. Leave Crane Unattended2%

Outcome: Secure hoisting equipment.

- 1. Describe the procedure for leaving a crane unattended for short periods.
- 2. Describe the procedure for leaving a crane unattended for long periods.
- 3. Describe the procedure for leaving a crane unattended for extended periods.

SECTION SIX:SPECIALTY LIFTS AND WORKPLACE COACHING, 13%

A. Multi-Crane Lifts 42%

Outcome: Perform a multi-crane lift.

- 1. Plan a multi-crane lift.
- 2. Set up a multi-crane lift.
- 3. Perform a multi-crane lift.

B. Personnel Baskets 25%

Outcome: ***Describe the use of a personnel basket.***

1. Explain the requirements for attaching a suspended personnel platform to hoisting equipment.
2. Explain the procedures for hoisting a suspended personnel basket.

C. New Technology 21%

Outcome: ***Describe new hoisting equipment technology.***

1. Describe new technology used in hoisting and rigging equipment.

D. Workplace Coaching Skills..... 12%

Outcome: ***Use coaching skills when training an apprentice.***

1. Describe the process for coaching an apprentice.

**THIRD PERIOD TECHNICAL TRAINING
CRANE AND HOISTING EQUIPMENT OPERATOR – MOBILE CRANE OPERATOR TRADE
CURRICULUM GUIDE**

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:..... LATTICE BOOM CRANES..... 12%

A. Types of Lattice Boom Cranes 19%

Outcome: *Describe types of lattice boom cranes.*

1. Describe truck mounted lattice boom cranes.
2. Describe crawler mounted lattice boom cranes
3. Explain friction drawworks operation.

B. Lattice Boom Crane Components 27%

Outcome: *Describe lattice boom crane components.*

1. Describe truck mounted lattice boom components.
2. Describe crawler mounted lattice boom components.
3. Describe friction drawworks components.

C. Lattice Boom Crane Inspections and Maintenance..... 27%

Outcome: *Inspect and maintain lattice boom cranes.*

1. Describe tools used to assemble and maintain lattice boom.
2. Identify maintenance on engines.
3. Identify maintenance on hydraulic systems.
4. Identify maintenance on air systems.
5. Identify maintenance on mechanical components and structures.
6. Identify maintenance on electrical systems.
7. Describe the types and characteristics of lubricant.
8. Identify the lubrication points on each component.

D. Mobile Telescopic Cranes 27%

Outcome: *Describe types of mobile telescopic cranes.*

1. Describe pinned boom technology.
2. Describe a telescopic boom crawler crane.
3. Describe all terrain suspensions.
4. Describe all terrain removable counter weights.
5. Describe the use of dollies.

SECTION TWO:.....CRANE ATTACHMENTS AND CRANE ASSEMBLY 19%

A. Jibs 9%

Outcome: Describe types of jibs.

1. Describe fixed jibs.
2. Describe hydraulic offset jibs.
3. Describe cable luffing jibs.
4. Describe boom extensions.

B. Heavy Lift Attachments 18%

Outcome: Describe heavy lift attachments.

1. Describe ballast wagons and components.
2. Describe ballast trays and components.
3. Describe guyed boom.
4. Describe ringer attachment configurations.
5. Describe a strand jacking system.

C. Specialty Accessories 6%

Outcome: Describe specialty accessories.

1. Describe earth moving accessories.
2. Describe material handling accessories.
3. Describe the use of a demolition ball.
4. Describe pile driving accessories.

D. Site Preparation..... 18%

Outcome: Prepare site for crane.

1. Recognize ground site conditions.
2. Identify site hazards (powerlines, underground utilities, buildings).
3. Calculate ground bearing pressure.
4. Determine space requirements for assembly and disassembly.
5. Determine space requirements for lifting operations.

E. Loading and Unloading Cranes and Components 19%

Outcome: Describe loading and unloading crane components.

1. Describe loading and unloading of carbody.
2. Describe the loading and unloading of the upperworks.
3. Describe the loading and unloading of track frames.
4. Describe the loading and unloading of boom components.
5. Describe the loading and unloading of counterweights.

F. Crane Assembly and Disassembly 30%

Outcome: Assemble and disassemble cranes and components.

1. Describe the sequence of assembly and disassembly of lattice boom cranes.
2. Describe the assembly and disassembly of hydraulic telescopic cranes.

SECTION THREE:ADVANCED RIGGING 18%

A. Specialty Rigging Equipment 19%

Outcome: Describe specialty rigging equipment.

1. Describe the application of specialty rigging equipment (i.e. rolling blocks, jigs, transfer beams).
2. Select appropriate specialty rigging equipment.
3. Describe heavy lift rigging equipment.

B. Advanced Rigging Procedures 18%

Outcome: Perform advanced rigging procedure.

1. Describe advanced rigging on an off center of gravity load.
2. Describe the application of multi-point rigging attachments.
3. Describe heavy lift rigging procedures.

C. Advanced Rigging Calculations 63%

Outcome: Calculate advanced rigging configurations.

1. Calculate load weights for various shaped loads of different materials.
2. Determine combined center of gravity.
3. Determine the center of gravity for off center of gravity loads.
4. Calculate loads on equalizer beams.

SECTION FOUR:ADVANCED LIFT PLANNING AND OPERATIONS 33%

A. Critical Lift Planning 16%

Outcome: Plan a critical lift.

1. Determine critical lift criteria.
2. Determine the type of critical lift.
3. Create a critical lift plan drawing.
4. Explain the sequence of a critical lift.
5. Explain the hazard controls of a critical lift.

B. Multi-Crane Lift 42%

Outcome: Plan a multi-crane lift.

1. Determine the type of multi-crane lift (tailing, straight, maneuvering).
2. Determine share of load.
3. Determine the percentage of capacity for each crane.

4. Explain lift dynamics for standing a load.
5. Explain the sequence of a multi-crane lift.
6. Create a multi-crane lift plan drawing.
7. Perform a multi-crane lift.

C. Single Crane Operations 42%

Outcome: Plan a lift.

1. Perform pick and carry operations on rubber.
2. Perform lifts on outriggers.
3. Perform a standing lift.
4. Perform a lift with a jib.

SECTION FIVE:LOAD CHART, LIFTING OPERATIONS AND RED SEAL 18%

A. Advanced Load Chart Interpreting 76%

Outcome: Perform advanced load chart calculations.

1. Perform lift calculations for a critical lift.
2. Perform a lift calculation for an offset jib.
3. Perform a lift calculation for a luffing jib.
4. Perform a lift calculation for load using a specialty attachment.

B. Lift Dynamics 18%

Outcome: Describe lift dynamics.

1. Explain the dynamics of duty cycle work.
2. Explain the dynamics of wind during a lift.
3. Explain the dynamics of submerged loads.
4. Explain the dynamics of hoisting on floating surface.
5. Explain the dynamics of hoisting a stuck or frozen load.
6. Explain dynamics of shock loading.
7. Explain the dynamics of standing a load.
8. Explain the dynamics of transferring a load.

C. Interprovincial Standards Red Seal Program 6%

Outcome: Use red seal products to challenge an Interprovincial examination.

1. Identify Red Seal products used to develop Interprovincial examinations.
2. Use Red Seal products to prepare for an Interprovincial examination.



Apprenticeship and Industry Training

Alberta Trades. World Ready.

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