

Apprenticeship and Industry Training

Crane and Hoisting Equipment Operator Wellhead Boom Truck Curriculum Guide

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Apprenticeship
and Industry
Training

ALBERTA ADVANCED EDUCATION

Crane and hoisting equipment operator wellhead boom truck operator : apprenticeship education program curriculum guide

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**Crane and Hoisting Equipment Operator—Wellhead Boom Truck
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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 Crane and Hoisting Equipment Operator—Wellhead Boom Truck apprenticeship education program is an individual who will be able to:

- correctly use and care for tools and materials which are required to carry out the normal service and maintenance of the machines of the industry
- operate and describe functions of the major and minor components of boom trucks
- recognise and identify malfunctions and the proper procedures related thereto
- recognise and evaluate conditions which are potentially hazardous to safe machine operation
- interpret and apply visual and audio communication
- perform assigned tasks in accordance with quality and production standards required by industry

Apprenticeship and Industry Training System

Alberta's apprenticeship 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. J. Lane Ft. McMurray
Mr. D. Cadotte Lacombe
Mr. L. Tucker Edmonton
Mr. B. Tario Calgary
Mr. D. Provencal Ft. McMurray
Mr. A. McKernon Red Deer
Mr. M. Packolyk Slave Lake
Mr. S. Murphy Wainwright
Mr. E. Pinksen Ft. McMurray
Mr. B. Kosmack Calgary
Mr. M. McDonnell Edmonton
Mr. B. Mahon Onoway
Mr. L. Schnepf Red Deer

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

Apprenticeship 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 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.

For information regarding the delivery of the program, please contact the nearest Apprenticeship office.

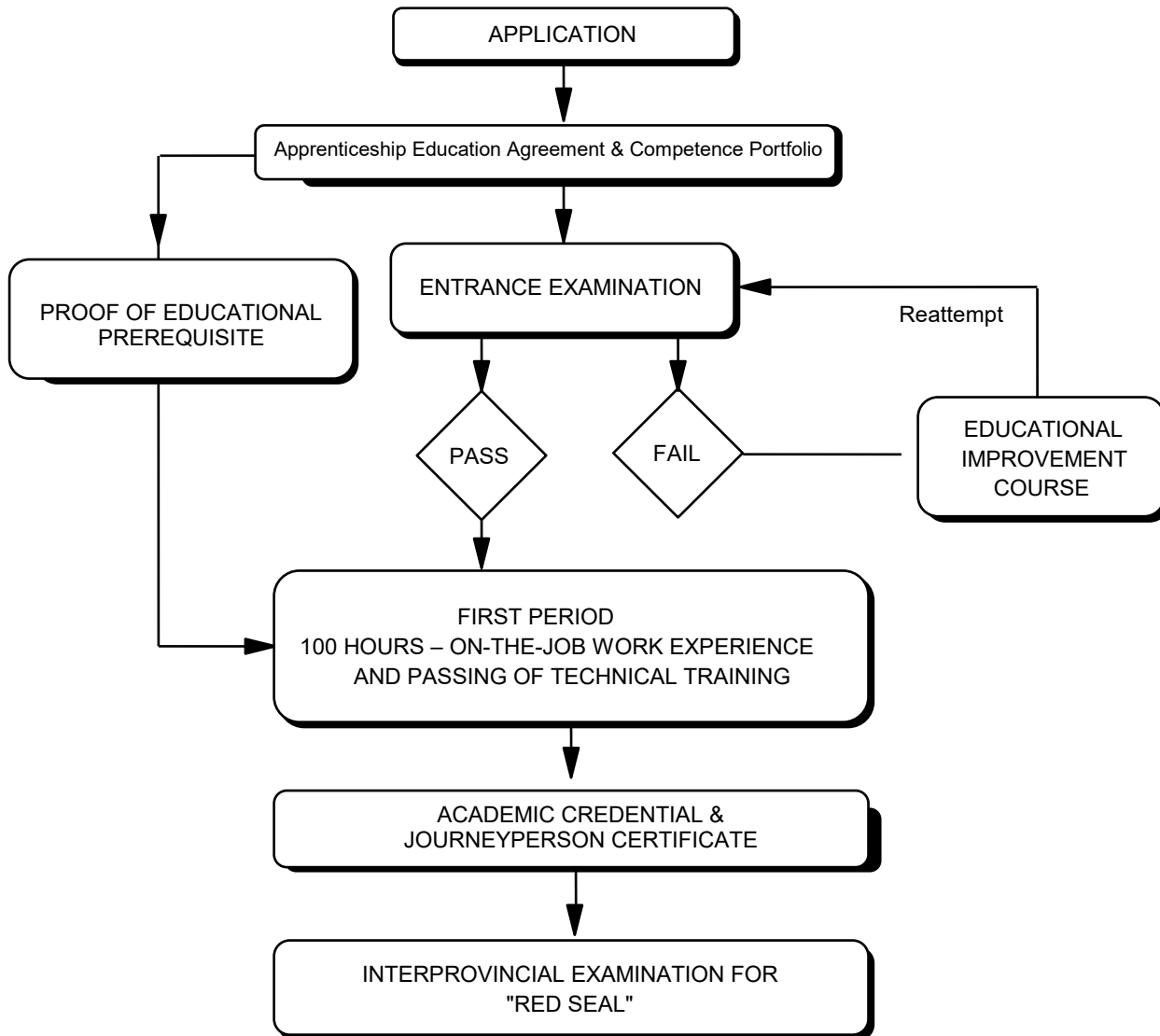
Procedures for Recommending Revisions to the Course Outline

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—Wellhead Boom Truck Training Profile
FIRST PERIOD**

(5 Days – Total of 40 Hours) Day 5 is reserved for theory, load chart and practical testing

SECTION ONE

**WELLHEAD BOOM TRUCK
THEORY**

63%



A	B	C
Boom Truck Components 10%	Boom Truck Inspections 5%	Rules and Responsibilities 5%
D	E	F
Safe Operating Practices 20%	Principles of Leverage 5%	Areas of Operation 5%
G	H	
Pre-Lift Planning and Load Chart Calculations 40%	Rigging Hardware, Wire Rope and Rigging Safety 10%	

SECTION TWO

**WELLHEAD BOOM TRUCK
PRACTICAL**

37%



A	B
Load Rigging Practices 17%	Hands on Boom Truck Operator Training 83%

**FIRST PERIOD TECHNICAL TRAINING
CRANE AND HOISTING EPMENT OPERATOR—WELLHEAD BOOM TRUCK TRADE
CURRICULUM GUIDE**

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

SECTION ONE:WELLHEAD BOOM TRUCK THEORY 63%

A. Boom Truck Components 10%

Outcome: *Explain and demonstrate knowledge of boom trucks and components.*

1. Identify the components of hydraulic boom trucks and/or articulating boom trucks:
 - a) truck chassis
 - b) rear/front stabilizers
 - c) turret or pedestal (including mounting bolts)
 - d) swing circle
 - e) base or heel section
 - f) telescopic powered and manual boom sections
 - g) boom extensions
 - h) main hoist
 - i) main hoist line
 - ii) main hoist block
 - iii) winch
 - iv) sheaves
 - i) auxiliary hoist
 - i) auxiliary hoist line (whip)
 - ii) auxiliary hoist ball and hook (headache overhaul)
 - j) boom
 - i) boom section
 - ii) telescoping sections
 - iii) pinned sections
 - iv) boom extension cylinders
 - v) boom lift cylinders
 - vi) boom wear pads
 - vii) rest (cradle)
 - viii) sheaves
 - k) outriggers
 - i) outrigger beams
 - ii) outrigger jacks
 - iii) outrigger cylinders
 - iv) outrigger pads (floats or pontoons)
 - v) front bumper outrigger
 - l) swing assembly
 - i) pedestal
 - ii) turret
 - iii) rotation bearing (slewing ring, swing circle, ball race)

- m) carrier
 - i) frame
 - ii) sub frame
 - iii) bed (optional)
 - iv) brakes
 - v) tire types (highway)
 - vi) counterweight(s) (front bumper)
- n) control system
- o) load moment devices
- p) lock-outs

B. Boom Truck Inspections5%

Outcome: *Explain the importance of boom truck inspections and the requirements for maintaining equipment records.*

1. Explain the importance of regular inspections.
2. Explain the importance of keeping regular records of inspections and maintenance to ensure the following:
 - a) safer equipment
 - b) minimal breakdowns of equipment
 - c) lower operating costs
 - d) compliance with legislation
3. Identify and describe the frequency and types of equipment inspections. Perform and document equipment inspections. Describe the legislative requirements for inspections and log books. Identify and describe manufacturers' inspection requirements.

C. Rules and Responsibilities5%

Outcome: *Identify the rules and regulations that govern the wellhead boom truck operator.*

1. Identify and describe:
 - a) the boom truck owner's responsibilities
 - b) the boom truck operator's responsibilities the supervisor's responsibilities
2. Identify the codes and standards that govern/regulate the wellhead boom truck operator:
 - a) CAN/CSA-Z150-98
 - b) Crane and Hoisting Equipment Operator Trade Regulation
 - c) Occupational Health and Safety Act (construction and general)
 - d) Bill C45

D. Safe Operating Practices 20%**Outcome: Explain and demonstrate knowledge of safe operating practices.**

1. Describe the basic safe operating practices for:
 - a) the proper setup and use of outriggers
 - b) levelling the boom truck and the effects of not being level
 - c) two-blocking
 - d) not allowing personnel to ride on loads and hooks
 - e) avoiding rapid swings
 - f) shock loading – causes and prevention
2. Identify and describe how boom trucks can be overloaded by:
 - a) lifting loads in excess of the gross capacity of the crane
 - b) booming down and increasing load radius
 - c) telescoping out and increasing load radius
3. Explain the hazards of side loading crane booms:
 - a) dragging load
 - b) out of level set up
 - c) side loading
4. Describe the difference between structural and stability factors and the impact on boom truck operation.
5. Describe the following procedures for working around power lines:
 - a) maintaining limits of approach
 - b) ensuring that no worker comes in contact with the crane or load
 - c) using long, clean lengths of nylon rope for tag lines
 - d) using a dedicated signal person to watch approach limits
6. Describe the following procedures in the event of a power line contact:
 - a) warn people to stay away
 - b) operator remains at the controls
 - c) where possible, remove crane from power lines
 - d) operator exits the boom truck if necessary
7. Identify the limits of approach (applicable legislation).
8. Describe and perform the standard hand signals.
9. Identify the causes and prevention of the following types of crane accidents:
 - a) stability/structural failure
 - b) rigging failure

E. Principles of Leverage.....5%**Outcome: Explain principles of leverage.**

1. Describe the principles of leverage and the relationship between leverage and stability.
2. Define the following terms:
 - a) leverage of a crane
 - b) leverage of a load
 - c) tipping axis
 - d) centre of rotation
 - e) centre of gravity

- f) identify the symbol for centre of gravity
 - g) identify and determine the centre of gravity for major boom trucks
 - i) centre of gravity of a crane
 - ii) centre of gravity of a load
 - iii) centre of gravity location during rotation of upper works
3. Define fulcrum and how it applies to crane operation.
 4. Describe the load leverage principles including:
 - a) leverage and stability
 - b) stability vs. instability
 - c) effect of tipping axis location on stability and capacity
 5. Describe changes in crane leverage during rotation of upper works:
 - a) most stable area
 - b) less stable area
 - c) least stable area
 6. Describe changes in crane capacity during rotation of upper works for:
 - a) greatest capacity
 - b) less capacity
 - c) least capacity
 7. Describe the load moment for:
 - a) tipping moment
 - b) resisting moment
 8. Describe the tipping axis location as the upper structure rotates.
 9. Describe forward stability rating in percentage of tipping.
 10. Describe backward stability for a boom truck.
 11. Describe static load vs. dynamic load.
 12. Describe the effect of the load on the boom:
 - a) telescopic (stiff) booms
 - i) load on boom hoist
 - ii) cylinders (high angle)
 - iii) load taken on the boom in bending/deflection
 - iv) compression
 - b) articulating booms
 - i) load on boom hoist
 - ii) cylinders (high angle)
 - iii) load taken on the boom in bending/deflection
 - iv) compression

F. Areas of Operation.....5%

Outcome: Identify and explain areas of operation.

1. Describe the importance of areas of operation for boom trucks.
2. Identify the swing area.
3. Describe the division of swing area into quadrants.
4. Identify and describe working areas.

G. Pre-Lift Planning and Load Chart Calculations 40%**Outcome: Explain and demonstrate knowledge and skill in planning a lift.**

1. Describe how the factors listed below affect load chart conditions:
 - a) boom length
 - b) operating radius
 - c) boom angle
 - d) boom truck configuration
 - e) load weight
2. Describe and perform load chart calculations by interpreting load capacity charts from various manufacturers to:
 - a) identify and describe gross and net capacities
 - b) calculate total load
 - c) identify the difference between structural and stability values found in load capacity charts
 - d) identify quadrants of operation from load capacity chart data
 - e) interpret all information and warning notes contained in the load capacity charts and operator's manual

H. Rigging Hardware, Wire Rope and Rigging Safety..... 10%**Outcome: Explain and demonstrate knowledge and skill in safely rigging a load.**

1. Interpret breaking strengths, safety factors and safe working loads for slings, hoist ropes and pendants.
2. Perform wire rope and nylon web sling inspection.
3. Determine sling types, sizes and configurations for lifting loads by interpreting sling capacity charts.
4. Describe the importance of ensuring proper sling angles for multiple leg slinging of loads.
5. Identify criteria for taking wire rope slings and hoist ropes out of service for:
 - a) broken wires
 - b) core failures
 - c) localized damage
 - d) lubrication
6. Describe proper hoist line installation procedures.
7. Identify and describe uses for spreader bars and lift beams.
8. Identify and describe spreader bar/lift beam standards and inspection criteria.
9. Identify and describe the proper use of hooks and inspection criteria.
10. Identify and describe the proper use of shackles and inspection criteria.
11. Identify and describe the proper use of eye bolts and inspection criteria.
12. Identify and describe the proper installation techniques for cable clamps.
13. Describe and perform wedge socket installation.
14. Describe common wire rope termination efficiencies.
15. Identify the types of chain that can be used for hoisting.
16. Identify chain inspection criteria.
17. Describe hoist and chain inspections.

SECTION TWO:WELLHEAD BOOM TRUCK PRACTICAL..... 37%**A. Load Rigging Practices 17%****Outcome: Explain and demonstrate safe rigging practices.**

1. Describe the effects of load centre of gravity and sling location on load stability.
2. Identify and describe both safe and unsafe rigging practices.
3. Identify and describe sheave standards and inspection criteria.
4. Identify and describe drum standards and inspection criteria.
5. Identify and describe rigging hitches.
6. Describe procedures for taking defective rigging components out of service.

B. Practical Boom Truck Operator Training 83%**Outcome: Explain and demonstrate the safe operation of a wellhead boom truck.**

1. Describe and perform pre-operational inspections to:
 - a) check and top up all oil/fluid levels check the condition of belts, tires, pins and keepers
 - b) check the condition of mounting bolts and weldments
 - c) check the condition and spooling of wire rope hoist line
 - d) check the condition of the load block, hook, wedge/socket and safety latch
 - e) check the condition of all slings and rigging hardware
2. Document any unsafe items in the boom truck log book.
3. Describe and perform the removal from service of any unsafe items.
4. Measure the load radius.
5. Determine the total load from the net load.
6. Apply the total load to the values in the load capacity chart, area diagram and range diagram, to determine where the load can be placed prior to and after hoisting.
7. Set up and level the boom truck in accordance with the manufacturer's instructions, crane capacity and site conditions. Demonstrate proper use of outriggers, pads and blocking.
8. Rig different loads with proper sling sizes and configurations.
9. Describe, perform and follow standard hand signals.
10. Lift and place loads within the capacity of the machine.
11. Operate the equipment in a safe, smooth and controlled manner.

EXAMINATIONS

Upon completion of the course, the candidate will be required to successfully complete the following examinations:

A hands-on, practical examination of the candidate's performance skills. This examination will be a maximum of two and one half hours in duration.

A written examination administered by Alberta Advanced Education. This examination will be a maximum of three hours in duration.



Apprenticeship and Industry Training

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