Apprenticeship and Industry Training

Crane and Hoisting Equipment Operator Wellhead Boom Truck

Apprenticeship Course Outline

34-4-06.3 (2006)

Alberta

Apprenticeship and Industry Training

ALBERTA ADVANCED EDUCATION CATALOGUING IN PUBLICATION DATA

Alberta. Alberta Advanced Education. Apprenticeship and Industry Training.
Crane and hoisting equipment operator wellhead boom truck operator :
apprenticeship course outline.

ISBN 0-7785-4774-4

1. Cranes, derricks, etc. - Maintenance and repair - Study and teaching - Alberta.
2. Hoisting machinery - Maintenance and repair - Study and teaching - Alberta.
3. Apprentices - Alberta. 4. Occupational and training - Alberta. 5. Apprenticeship programs -Alberta. I. Title. II. Series: Apprenticeship and training industry.

HD4885.C2.C72.A333 2006 372.27

Crane and Hoisting Equipment Operator—Wellhead Boom Truck
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Course Outline

Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeypersons, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of Crane and Hoisting Equipment Operator—Wellhead Boom Truck Provincial Apprenticeship Committee.

The graduate of the Crane and Hoisting Equipment Operator—Wellhead Boom Truck apprenticeship program is a certified journeyperson 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

Industry-Driven

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

Alberta Apprenticeship and Industry Training Board

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education and Technology on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

Industry Committee Network

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

Local Apprenticeship Committees (LAC)

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

Provincial Apprenticeship Committees (PAC)

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- Make recommendations to the board about:
    - standards and requirements for training and certification in their trade
    - courses and examinations in their trade
    - apprenticeship and certification
    - designation of trades and occupations
    - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

Crane and Hoisting Equipment Operator—Wellhead Boom Truck PAC Members at the Time of Publication

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

Alberta Government

Alberta Advanced Education and Technology works with industry, employer 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 employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Technical Institutes and Colleges

The technical institutes and colleges are key participants in Alberta's apprenticeship and industry training system. They work with the board, industry committees and Alberta Advanced Education and Technology to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs. They develop lesson plans from the course outlines established by industry and provide technical training to apprentices.

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, employers, 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.

Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training- in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behaviour is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

> **The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act.***

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at www.tradesecrets.alberta.ca; access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

Addendum
As immediate implementation of the board's safety policy includes common safety learning outcomes and objectives for all course outlines, this trade's PAC will be inserting these safety outcomes into the main body of their course outline at a later date. In the meantime the addendum below immediately places the safety outcomes and their objectives into this course outline thereby enabling technical training providers to deliver the content of these safety outcomes.

STANDARD WORKPLACE SAFETY

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

Outcome: ***Describe legislation, regulations and practices intended to ensure a safe work place in this trade.***

1. Demonstrate the ability to apply the Occupational Health and Safety Act, Regulation and Code.
2. Explain the role of the employer and employee in regard to 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. Explain industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of workers and employers to apply emergency procedures.
5. Describe positive tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective equipment (PPE).
7. Select, use and maintain appropriate PPE for worksite applications.

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

Outcome: ***Describe the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting in this trade.***

1. Select, use and maintain specialized PPE for climbing, lifting and load moving equipment.
2. Describe manual lifting procedures using correct body mechanics.
3. Describe rigging hardware and the safety factor associated with each item.
4. Select the correct equipment for rigging typical loads.
5. Describe hoisting and load moving procedures.

C. Hazardous Materials & Fire Protection.....

Outcome: ***Describe the safety practices for hazardous materials and fire protection in this trade.***

1. Describe the roles, responsibilities features and practices related to the workplace hazardous materials information system (WHMIS) program.
2. Describe the three key elements of WHMIS.
3. Describe handling, storing and transporting procedures when dealing with hazardous material.
4. Describe safe venting procedures when working with hazardous materials.
5. Describe fire hazards, classes, procedures and equipment related to fire protection.

Workplace Health and Safety

A tradesperson is often exposed to more hazards than any other person in the work force 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.

Workplace Health and Safety (Alberta Employment, Immigration and Industry) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.worksafely.org

Technical Training

Apprenticeship technical training is delivered by the technical institutes and many colleges in the public post-secondary system throughout Alberta. The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place great emphasis on safe technical practices that complement safe workplace practices and help to develop a skilled, safe workforce.

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

Procedures for Recommending Revisions to the Course Outline

Advanced Education and Technology has prepared this course outline in partnership with the Crane and Hoisting Equipment Operator—Wellhead Boom Truck Provincial Apprenticeship Committee.

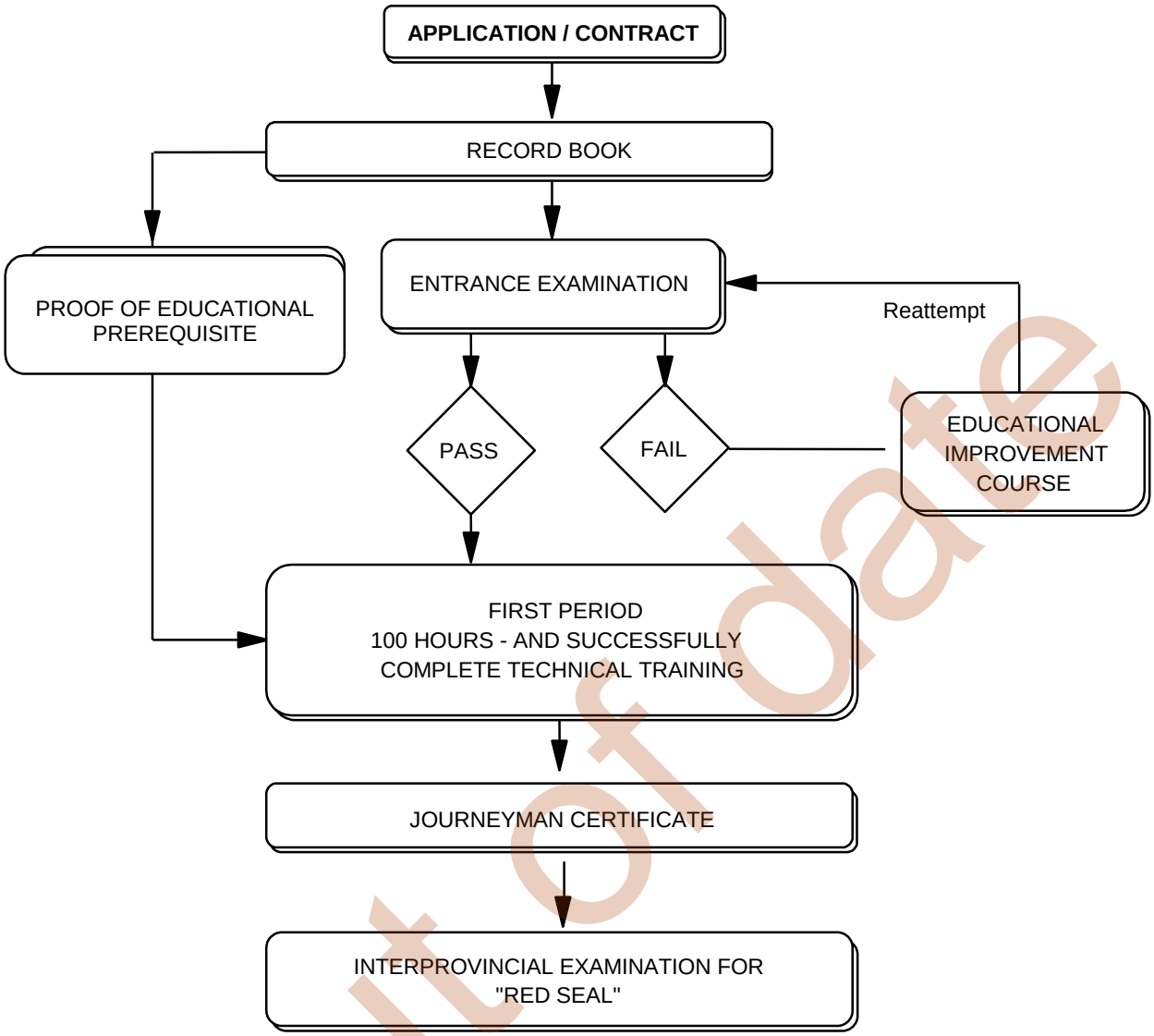
This course outline was approved on March 20, 2006 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

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

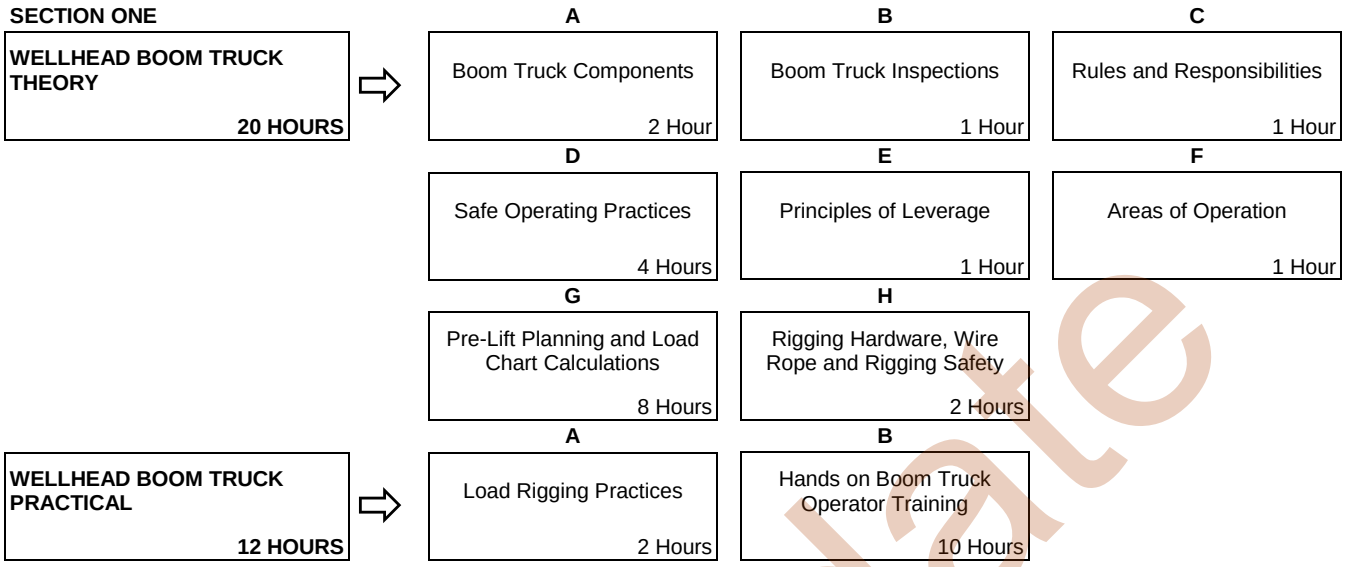
Crane and Hoisting Equipment Operator—Wellhead Boom Truck Provincial Apprenticeship Committee
c/o Industry Programs and Standards
Apprenticeship and Industry Training
Advanced Education and Technology
10th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Crane and Hoisting Equipment Operator—Wellhead Boom Truck Provincial Apprenticeship Committee.

Apprenticeship Route toward Certification



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



NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

FIRST PERIOD TECHNICAL TRAINING
CRANE AND HOISTING EQUIPMENT OPERATOR—WELLHEAD BOOM TRUCK TRADE
COURSE OUTLINE

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

SECTION ONE: .....WELLHEAD BOOM TRUCK THEORY.....20 HOURS

A. Boom Truck Components .....2 Hours

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 Inspections .....1 Hour

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.
4. Perform and document equipment inspections.
5. Describe the legislative requirements for inspections and log books.
6. Identify and describe manufacturers' inspection requirements.

C. Rules and Responsibilities .....1 Hour

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
   c) 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 .....4 Hours

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.....1 Hour

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.....1 Hour

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 .....8 Hours

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.....2 Hours

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.....12 HOURS

A. Load Rigging Practices .....2 Hour

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 .....10 Hours

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
   b) check the condition of belts, tires, pins and keepers
   c) check the condition of mounting bolts and weldments
   d) check the condition and spooling of wire rope hoist line
   e) check the condition of the load block, hook, wedge/socket and safety latch
   f) 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 and Technology. This examination will be a maximum of three hours in duration.

Apprenticeship and Industry Training

Alberta Trades. World Ready.

34-4-06.3