SKILLEDTRADES BC

PROGRAM OUTLINE

Boom Truck Operator –
Stiff Boom Unlimited Tonnage

SKILLED TRADES BC

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BOOM TRUCK OPERATOR –
STIFF BOOM UNLIMITED TONNAGE
PROGRAM OUTLINE

APPROVED BY INDUSTRY

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Developed by
Industry Training Authority
Province of British Columbia

SKILLED TRADES BC

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Section 1

INTRODUCTION

Boom Truck Operator –

Stiff Boom Unlimited Tonnage

Foreword

This Program Outline is used to guide competency-based training of crane operators who operate Boom Trucks with Stiff Booms (unlimited tonnage).

This Program Outline contains both Theory and Practical standards of competence. Theory standards may be achieved outside the performance of the learner's regular work; for example, in a classroom or through self-study of learning resources. Practical standards build upon the theory and allow learners to gather naturally occurring evidence of workplace performance while they work.

Typically, credit for theory standards will be achieved through learning sponsored by SkilledTradesBC. The theory standards described in this document define the desired knowledge outcome for learners to achieve. Industry wishes learners to have options for achieving credit for these theory standards, including using a variety of non-traditional learning methodologies such as distance education and self-study.

Safe working practices, though not always specified in each of the competencies, are a part of the safe working and learning conditions underlying all these standards and will be required in the presentation of evidence to meet these standards.

This Program Outline includes a list of recommended reference textbooks that are available to support achievement of the standards.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation. The current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

These standards were developed through extensive consultation with a broad cross-section of stakeholders in BC's crane industry – crane owners, operators and other occupations which make occasional yet regular use of cranes.

BC Crane Safety is a non-profit society which was formed in 2005 to lead and coordinate activities and initiatives which promote safer crane operation in BC. BC Crane Safety was established and is governed by a volunteer board of crane industry stakeholders. The organization's main goals include setting the standard for competent crane operation in BC and promoting the industry standard to drive excellence in crane operator training. BC Crane Safety led the development of these standards through funding support from WorkSafeBC and SkilledTradesBC.

This work would not have been possible without the contribution of thousands of hours of industry stakeholder time through the BC Crane Safety task groups. BC Crane Safety wishes to thank those Subject Matter Experts (SMEs) who contributed to this development effort.

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Boom Truck Operator – Stiff Boom Unlimited Tonnage occupation.

How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
Program Assessment	Communicate program completion requirements and assessment methods	Understand the various assessment requirements for the program	Understand the various assessment requirements for the program	Understand the assessment requirements they would have to fulfill in order to challenge the program
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

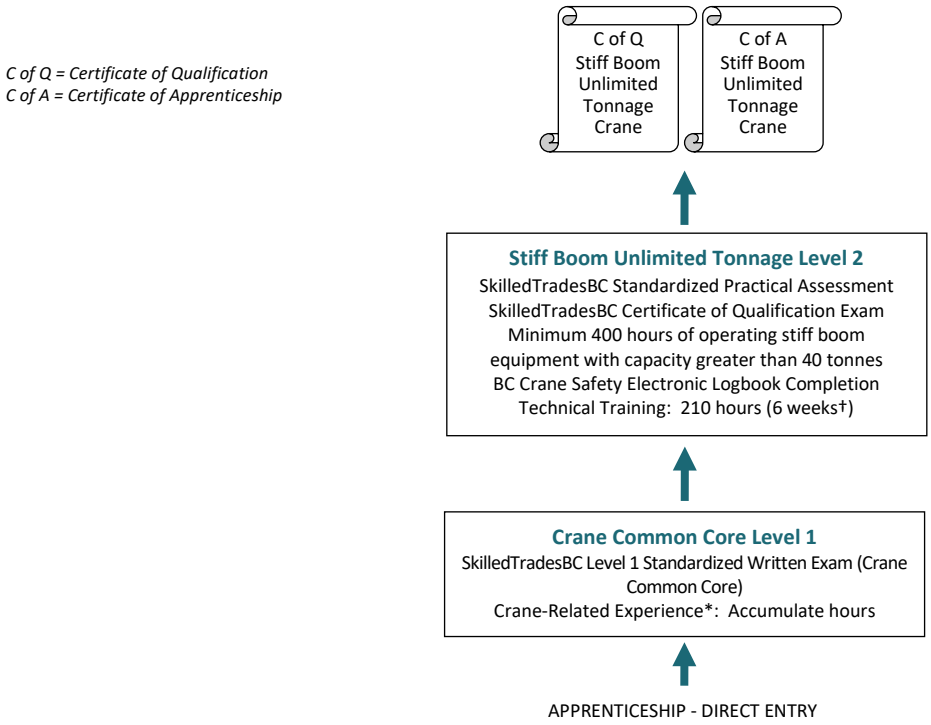
Section 2

PROGRAM OVERVIEW

Boom Truck Operator –
Stiff Boom Unlimited Tonnage

Apprenticeship Pathway

This graphic provides an overview of the Boom Truck Operator – Stiff Boom Unlimited Tonnage apprenticeship pathway.



** Crane-related experience as entered in the operator's BC Crane Safety electronic logbook*
† Suggested duration based on 35-hour week

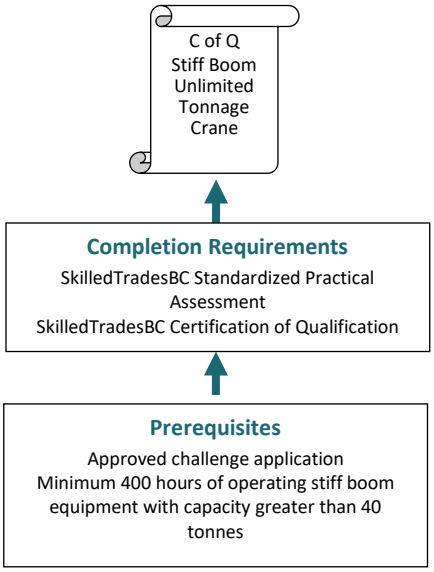
CROSS-PROGRAM CREDITS
Individuals who hold partial credit in a crane program and plan to move to an alternate crane program

Crane Common Core Level 1	Technical Training: Level 1, including SkilledTradesBC Level 1 Standardized Written Exam (Crane Common Core)

Challenge Pathway

This graphic provides an overview of the Boom Truck Operator – Stiff Boom Unlimited Tonnage challenge pathway.

C of Q = Certificate of Qualification



CREDIT FOR PRIOR LEARNING

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

Occupational Analysis Chart

BOOM TRUCK OPERATOR – STIFF BOOM UNLIMITED TONNAGE

Occupation Description: "Stiff Boom Unlimited Tonnage" operator means a person who operates a truck mounted hydraulic stiff boom crane with capacity over 40 tonnes to perform lifts and hoists, places and secures loads, sets up the crane, takes down the crane and plans lifts and crane procedures.

SAFETY A	A1	Demonstrate knowledge of safe working practices for crane operators		1				
	A2	Demonstrate knowledge of power line hazards and high voltage equipment		1				
	A3	Comply with WorkSafeBC Occupational Health and Safety Regulation (OHSR)	W	1				
COMMUNICATIONS B	B1	Demonstrate knowledge of personnel involved in crane operations		1				
	B2	Demonstrate knowledge of hand signals		1				
	B3	Demonstrate knowledge of radio communications		1				
	B4	Demonstrate knowledge of workplace communications		1				
	B5	Use hand signals in the workplace	W	1				
	B6	Use radio communications in the workplace	W	1				
	B7	Communicate information clearly and check for understanding in the workplace	W	1				
CRANES C	C1	Demonstrate knowledge of types of cranes and classifications		1				
	C2	Demonstrate knowledge of terminology related to craning and craning concepts		1				
	C3	Demonstrate knowledge of hoisting terminology, functions and systems		1				
	C4	Demonstrate knowledge of regulatory requirements pertaining to cranes		1				
	C5	Demonstrate knowledge of crane components and attachments for boom trucks			2			
	C6	Demonstrate knowledge of engines and ancillary systems			2			
	C7	Demonstrate knowledge of power transfer for boom trucks			2			

W = Knowledge or skills are primarily acquired in the workplace
EN = Endorsement
EL = Elective

RIGGING AND LIFTING THEORY **D**	Demonstrate knowledge of lifting theory and forces D1					Demonstrate knowledge of slings (all types), rigging hardware, materials, inspection and capacity cards D2					Demonstrate knowledge of wire rope hoist line construction and inspection D3					Use rigging hardware and tools in the workplace W D6				
	1					1					1					1				
HOISTING FUNDAMENTALS **E**	Demonstrate knowledge of determining load weights using fundamental math functions and calculations E1					Demonstrate knowledge of determining the capacity of a crane using load charts E2					Interpret load charts and load study drawings to configure crane for workplace operation W E3									
	1					1					1									
TRANSPORTATION AND DELIVERY **F**	Demonstrate knowledge of BC Ministry of Transportation – Commercial Transport rules and regulations F1					Demonstrate knowledge to prepare a boom truck and associated loads for highway/road travel F2					Prepare and transport a mobile crane to a worksite following all highway and traffic rules and regulations W F4					Prepare a boom truck and associated loads for highway/road travel W F6				
		2					2					2					2			
SITE PLANNING AND CRANE POSITIONING **G**	Demonstrate knowledge of accurate site assessment tools G1					Demonstrate knowledge to locate and safely position a crane G2					Conduct an accurate site assessment and safely position a crane in the workplace W G3					Conduct an accurate site assessment and safely position a boom truck with a folding boom (unlimited tonnage) in the workplace W G7				
		2					2					2					2			

																Conduct an accurate site assessment and safely position a boom truck with a stiff boom (unlimited tonnage) in the workplace W G11				
																	2			

W = Knowledge or skills are primarily acquired in the workplace
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EL = Elective

CRANE OPERATIONS **H**	Demonstrate knowledge of pre-operational requirements in crane operations H1 1	Demonstrate knowledge of crane operations H2 2	Demonstrate knowledge of lifting plans and rigging for cranes H3 2	Demonstrate knowledge of folding boom (unlimited tonnage) load charts and load calculations H4 2	Demonstrate knowledge of stiff boom (unlimited tonnage) load charts and load calculations H5 2	Conduct pre-operational inspections of mobile cranes and equipment in the workplace W H8 1
	Conduct safe crane set-up according to manufacturer's specifications W H9 1	Operate a boom truck with a folding boom (unlimited tonnage) to lift and place loads in the workplace W H10 2	Operate a boom truck with a stiff boom (unlimited tonnage) to lift and place loads in the workplace W H11 2	Leave a mobile crane unattended W H13 2		
MAINTENANCE AND SERVICE **I**	Maintain an equipment logbook to retain a permanent written record of maintenance and repairs W I1 1	Demonstrate knowledge of inspecting engines, monitoring devices and hydraulic systems I2 2	Demonstrate knowledge of servicing and maintenance procedures I3 2	Perform service on engine cooling systems on mobile cranes W I7 2	Complete maintenance checklists (engine on/ engine off) and maintain engines on boom trucks (unlimited tonnage) to manufacturer's specifications W I15 2	Perform routine inspections and maintenance on hydraulic systems on boom trucks (unlimited tonnage) W I16 2
	Inspect monitoring devices and control mechanisms on boom trucks with folding booms (unlimited tonnage) W I17 2	Inspect monitoring devices and control mechanisms on boom trucks with stiff booms (unlimited tonnage) W I27 2				

W = Knowledge or skills are primarily acquired in the workplace
EN = Endorsement
EL = Elective

Training Topics and Suggested Time Allocation

BOOM TRUCK OPERATOR – STIFF BOOM UNLIMITED TONNAGE – LEVEL 1

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**SAFETY**	**9%**	**70%**	**30%**	**100%**
A1	Demonstrate knowledge of safe working practices for crane operators		✓		
A2	Demonstrate knowledge of power line hazards and high voltage equipment		✓		
A3	Comply with WorkSafeBC Occupational Health and Safety Regulation (OHSR)			✓	
Line B	**COMMUNICATIONS**	**15%**	**60%**	**40%**	**100%**
B1	Demonstrate knowledge of personnel involved in crane operations		✓		
B2	Demonstrate knowledge of hand signals		✓		
B3	Demonstrate knowledge of radio communications		✓		
B4	Demonstrate knowledge of workplace communications		✓		
B5	Use hand signals in the workplace			✓	
B6	Use radio communications in the workplace			✓	
B7	Communicate information clearly and check for understanding in the workplace			✓	
Line C	**CRANES**	**12%**	**100%**	**0%**	**100%**
C1	Demonstrate knowledge of types of cranes and classifications		✓		
C2	Demonstrate knowledge of terminology related to craning and craning concepts		✓		
C3	Demonstrate knowledge of hoisting terminology, functions and systems		✓		
C4	Demonstrate knowledge of regulatory requirements pertaining to cranes		✓		
Line D	**RIGGING AND LIFTING THEORY**	**28%**	**75%**	**25%**	**100%**
D1	Demonstrate knowledge of lifting theory and forces		✓		
D2	Demonstrate knowledge of slings (all types), rigging hardware, materials, inspection and capacity cards		✓		
D3	Demonstrate knowledge of wire rope hoist line construction and inspection		✓		
D6	Use rigging hardware and tools in the workplace			✓	
Line E	**HOISTING FUNDAMENTALS**	**28%**	**70%**	**30%**	**100%**
E1	Demonstrate knowledge of determining load weights using fundamental math functions and calculations		✓		
E2	Demonstrate knowledge of determining the capacity of a crane using load charts		✓		
E3	Interpret load charts and load study drawings to configure crane for workplace operation			✓	

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line H	**CRANE OPERATIONS**	**6%**	**30%**	**70%**	**100%**
H1	Demonstrate knowledge of pre-operational requirements in crane operations		✓		
H8	Conduct pre-operational inspections of mobile cranes and equipment in the workplace			✓	
H9	Conduct safe crane set-up according to manufacturer's specifications			✓	
Line I	**MAINTENANCE AND SERVICE**	**2%**	**0%**	**100%**	**100%**
I1	Maintain an equipment logbook to retain a permanent written record of maintenance and repairs			✓	
	Total Percentage for Boom Truck Operator – Stiff Boom Unlimited Tonnage Level 1	**100%**			

Training Topics and Suggested Time Allocation

BOOM TRUCK OPERATOR – STIFF BOOM UNLIMITED TONNAGE – LEVEL 2

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line C	**CRANES**	**12%**	**100%**	**0%**	**100%**
C5	Demonstrate knowledge of crane components and attachments for boom trucks		✓		
C6	Demonstrate knowledge of engines and ancillary systems		✓		
C7	Demonstrate knowledge of power transfer for boom trucks		✓		
Line F	**TRANSPORTATION AND DELIVERY**	**8%**	**50%**	**50%**	**100%**
F1	Demonstrate knowledge of BC Ministry of Transportation – Commercial Transport rules and regulations		✓		
F2	Demonstrate knowledge to prepare a boom truck and associated loads for highway/road travel		✓		
F4	Prepare and transport a mobile crane to a worksite following all highway and traffic rules and regulations			✓	
F6	Prepare a boom truck and associated loads for highway/road travel			✓	
Line G	**SITE PLANNING AND CRANE POSITIONING**	**12%**	**40%**	**60%**	**100%**
G1	Demonstrate knowledge of accurate site assessment tools		✓		
G2	Demonstrate knowledge to locate and safely position a crane		✓		
G3	Conduct an accurate site assessment and safely position a crane in the workplace			✓	
G7	Conduct an accurate site assessment and safely position a boom truck with a folding boom (unlimited tonnage) in the workplace			✓	
G11	Conduct an accurate site assessment and safely position a boom truck with a stiff boom (unlimited tonnage) in the workplace			✓	

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line H	**CRANE OPERATIONS**	**58%**	**60%**	**40%**	**100%**
H2	Demonstrate knowledge of crane operations		✓		
H3	Demonstrate knowledge of lifting plans and rigging for cranes		✓		
H4	Demonstrate knowledge of folding boom (unlimited tonnage) load charts and load calculations		✓		
H5	Demonstrate knowledge of stiff boom (unlimited tonnage) load charts and load calculations		✓		
H10	Operate a boom truck with a folding boom (unlimited tonnage) to lift and place loads in the workplace			✓	
H11	Operate a boom truck with a stiff boom (unlimited tonnage) to lift and place loads in the workplace			✓	
H13	Leave a mobile crane unattended			✓	
Line I	**MAINTENANCE AND SERVICE**	**10%**	**30%**	**70%**	**100%**
I2	Demonstrate knowledge of inspecting engines, monitoring devices and hydraulic systems		✓		
I3	Demonstrate knowledge of servicing and maintenance procedures		✓		
I7	Perform service on engine cooling systems on mobile cranes			✓	
I15	Complete maintenance checklists (engine on/engine off) and maintain engines on boom trucks (unlimited tonnage) to manufacturer's specifications			✓	
I16	Perform routine inspections and maintenance on hydraulic systems on boom trucks (unlimited tonnage)			✓	
I17	Inspect monitoring devices and control mechanisms on boom trucks with folding booms (unlimited tonnage)			✓	
I27	Inspect monitoring devices and control mechanisms on boom trucks with stiff booms (unlimited tonnage)			✓	
	Total Percentage for Boom Truck Operator – Stiff Boom Unlimited Tonnage Level 2	**100%**			

Section 3

PROGRAM CONTENT

Boom Truck Operator –
Stiff Boom Unlimited Tonnage

Level 1

Boom Truck Operator –

Stiff Boom Unlimited Tonnage

Line (GAC): A SAFETY

Competency: A1 Demonstrate knowledge of safe working practices for crane operators

Objectives

To be competent in this area, the individual must be able to:

- Describe how to isolate, minimize and eliminate workplace hazards.
- Describe the types of personal protective equipment.

LEARNING TASKS	CONTENT

1. Describe workplace hazards in terms of the WorkSafeBC Occupational Health and Safety Regulation (OHSR) and how to eliminate, isolate, or minimize hazards	• Energy source hazards
	  ○ Hydraulic
	  ○ Electrical
	  ○ Pneumatic
	  ○ Potential energy
	• Overhead hazards
	  ○ Power lines
	  ○ Cranes/other equipment
	  ○ Obstructions
	• Mobile machinery hazards
	  ○ Trucks
	  ○ Cranes
	  ○ Mobile equipment
	• Rotating equipment hazards
	  ○ Belts
	  ○ Pulleys
	  ○ Sheaves
	  ○ Sprockets
	  ○ Chains
	  ○ Pinch points
	  ○ Barriers

2. Demonstrate knowledge of worksite hazard risk assessment and risk management procedures	• Responsibility to maintain a safe work environment • Changing weather • Frozen surfaces • Traffic • Location • Operating blind • Slips • Trips and falls • Injury to others • Injury from moving machinery

- Methods of communicating risks and risk situations to others
  - Signage
  - Tagging
  - Verbal communications
  - Written communications
  - Safe work cards
  - Risk hazard assessment procedures
- Notification to local utilities when operating near utility lines or potential hazards
  - Assurance in writing
  - Safety watcher

3. Demonstrate knowledge of accident and incident reporting procedures
   - Report form completion
   - Report form processing

4. Describe personal protection equipment
   - Breathing protection equipment
     - Respirators and filters
   - Personal protective equipment (PPE) and clothing
     - Hard hat
     - Safety boots
     - Protective eyewear
     - Hearing protection
     - High visibility apparel
     - Hand protection

5. Demonstrate knowledge of response to fire emergencies
   - Fire extinguishers
     - Types and capacities
     - Servicing
     - Use
   - Fighting electrical fires
     - Power isolation
     - Appropriate firefighting equipment
   - Fire emergency response and evacuation procedures in accordance with industry practice

6. Describe procedure for emergency rescue from a crane
   - Crane accident
   - Crane fire
   - Crane tip-over (access to cab is blocked)
   - Submerged crane

7. Describe the 3-point contact method when mounting and dismounting equipment	• Cranes • Other heavy equipment • Manufacturer specific access systems • Handholds and step ladders
8. Describe the requirements for leaving a crane unattended	• Knowledge of applicable WorkSafeBC regulations

Line (GAC): A SAFETY

Competency: A2 Demonstrate knowledge of power line hazards and high voltage equipment

Objectives

To be competent in this area, the individual must be able to describe procedures and safety precautions when operating a crane in the vicinity of overhead conductors.

LEARNING TASKS	CONTENT
1. Describe procedures for operating in proximity of overhead conductors	• High voltage signage • Safe limits of approach to overhead conductors • Assurance in writing from the local power authority • Critical lift procedure • Voltage determination • Risk factors when working near powerlines (wind, load size/profile) • Use of tag lines

Line (GAC): A SAFETY

Competency: A3 Comply with WorkSafeBC Occupational Health and Safety Regulation (OHSR)

Objectives

To be competent in this area, the individual must be able to interpret and comply with WorkSafeBC Occupational Health and Safety Regulation (OHSR) during crane operation.

LEARNING TASKS	CONTENT

1. Comply with WorkSafeBC Occupational Health and Safety Regulation (OHSR) and procedures applicable to workers in the workplace by demonstrating knowledge gained in training	• Reporting procedures
	• Thorough workplace inspections
	• WorkSafeBC Occupational Health and Safety Regulation (OHSR), standards and guidelines in the workplace
	  ○ Safe operating practices
	  ○ Safely landed and supported loads
	  ○ Controls attended while load is suspended

Achievement Criteria

Performance	Demonstrate competence complying with WorkSafeBC Occupational Health and Safety Regulation (OHSR).
Conditions	Trainee will be given a project(s) and the tools and materials required to demonstrate safe operating practices in accordance with WorkSafeBC Occupational Health and Safety Regulation (OHSR).
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): B COMMUNICATIONS

Competency: B1 Demonstrate knowledge of personnel involved in crane operations

Objectives

To be competent in this area, the individual must be able to describe the roles and responsibilities of personnel in the workplace.

LEARNING TASKS	CONTENT
1. Describe the personnel involved in a workplace and the roles they play	• Site supervisor • Crane operator • Rigger • Signal person • CSO – construction safety officer

Line (GAC): B COMMUNICATIONS

Competency: B2 Demonstrate knowledge of hand signals

Objectives

To be competent in this area, the individual must be able to describe, identify and interpret hand signals accurately.

LEARNING TASKS	CONTENT
1. Describe the hand signals used during crane operations	• Accurate descriptions • Identification and interpretation • Requirements of the signal person • Signal relaying for a blind lift

Line (GAC): B COMMUNICATIONS

Competency: B3 Demonstrate knowledge of radio communications

Objectives

To be competent in this area, the individual must be able to:

- Describe basic functions of radio communication devices.
- Use appropriate language and terminology during communication.

LEARNING TASKS	CONTENT

1. Describe the use of two-way electronic voice communication devices	• Basic functions of the radio communication devices
	• Language and terminology
	  ○ Short form words and phrases
	  ○ Use of 12 o'clock (clock face positioning reference) to aid in direction giving and interpreting
	• Communication device testing in a classroom environment
	  ○ Requirement to stop operation due to lost contact or interference

Line (GAC): B COMMUNICATIONS

Competency: B4 Demonstrate knowledge of workplace communications

Objectives

To be competent in this area, the individual must be able to:

- Describe and interpret basic workplace documents.
- Describe techniques to check for understanding.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of basic workplace documents and explain the need to correctly act on the content	• Basic written communications
	  ○ Work orders and written instructions
	  ○ Work records
	  ○ Equipment logbooks
	  ○ Basic project plan
	  ○ Written reports
	• Techniques for checking understanding
	  ○ Active and focused listening
	  ○ Key point recapping
	  ○ Instruction or sentence restatement
	  ○ Question clarification
	• Hazards to personnel and equipment when communication breaks down in terms of safety and liability
	• Causes of communication breakdowns
	  ○ Noise
	  ○ Language differences
	  ○ Hearing problem (that may not have been identified)
	  ○ Bias
	  ○ Attitude
	  ○ Issues with egos and arrogance
	  ○ Issues with timidness and fear of speaking up

Line (GAC): B COMMUNICATIONS

Competency: B5 Use hand signals in the workplace

Objectives

To be competent in this area, the individual must be able to use hand signals correctly during crane operations.

LEARNING TASKS	CONTENT
1. Use hand signals and respond to hand signals during crane operations	• Correct use • Identification and interpretation • Safe and correct completion of a crane operation

Achievement Criteria

Performance	Demonstrate competence using various hand signals.
Conditions	Trainee will be given a project(s) where they are required to identify, interpret and respond to various hand signals used during crane operations.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): B COMMUNICATIONS

Competency: B6 Use radio communications in the workplace

Objectives

To be competent in this area, the individual must be able to use basic functions of radio communication devices to relay information clearly.

LEARNING TASKS	CONTENT
1. Use a two-way electronic voice communication device in the workplace	• Use of basic functions of radio communication devices according to equipment instructions • Clear and easy to understand language and terminology • Clear, concise, relevant information

Achievement Criteria

Performance	Demonstrate competence using radio communication.
Conditions	Trainee will be given a project(s) and a two-way electronic voice communication device to relay information clearly using correct language and terminology.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): B COMMUNICATIONS

Competency: B7 Communicate information clearly and check for understanding in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Interpret basic workplace documents to accurately perform tasks.
- Communicate clearly and check for understanding.

LEARNING TASKS	CONTENT

1. Read and demonstrate the correct interpretation of workplace documents	• Interpretation and use of basic written communications in the workplace to accurately perform tasks as assigned
	  ○ Work orders and written instructions
	  ○ Maintenance records
	  ○ Equipment logbooks
	  ○ Basic project plan
	  ○ Written reports
	• Techniques to ensure clear communication is achieved in the workplace
	  ○ English workplace vocabulary
	  ○ Non-verbal communications
	  ○ Use of tone and volume
	  ○ Colloquialisms
	  ○ Cultural and geographical differences in language
	  ○ Tact
	  ○ Diplomacy
	  ○ Assertiveness
	• Techniques for checking understanding with colleagues
	  ○ Active and focused listening
	  ○ Key point recapping
	  ○ Instruction or sentence restatement
	  ○ Question clarification
	• No breakdown in communication
	• No exposure of personnel and equipment to hazards

	• Clear, fair and accurate communication despite

workplace communication barriers
- Noise
- Language differences
- Hearing problem (that may not have been identified)
- Bias
- Attitude
- Issues with egos and arrogance
- Issues with timidness and fear of speaking up

Achievement Criteria

Performance	Demonstrate competence communicating information clearly and checking for understanding.
Conditions	Trainee will be given a project(s) and the tools and materials required to communicate clearly and effectively in the workplace, including: • Interpreting various written communications to accurately perform tasks • Using techniques to check for understanding to avoid breakdowns in communication
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): C CRANES

Competency: C1 Demonstrate knowledge of types of cranes and classifications

Objectives

To be competent in this area, the individual must be able to describe the types and classifications of cranes and explain their key functions.

LEARNING TASKS	CONTENT

1. Describe the types of cranes and their key functions	• Types of cranes
	  ○ Boom trucks
	  ○ Mobile cranes
	  ○ Tower cranes
	  ○ Self-erect cranes
	• Crane classifications
	  ○ Carrier types (e.g. crawler, rubber)
	  ○ Hoist mechanisms (e.g. hydraulic, conventional, electrical)
	  ○ Lifting capacity
	  ○ Boom types (e.g. lattice, hydraulic, knuckle boom, luffing boom)
	  ○ Heavy lift cranes (e.g. super lift, ringer)
	  ○ Tower cranes
	  ○ Self-erect cranes

Line (GAC): C CRANES

Competency: C2 Demonstrate knowledge of terminology related to craning and craning concepts

Objectives

To be competent in this area, the individual must be able to define terms commonly used in the crane industry.

LEARNING TASKS	CONTENT
1. Describe terms related to cranes commonly used in the work environment	• Wire rope • Fittings • Drums • Hooks • Sheaves • Winch • Slew/swing • Hoist • Boom • Swing brake • Swing dog • Mast • Gantry • Overload protection systems • Anti-two block system • Load monitoring and indicating systems • Outriggers/stabilizers • Counterweight • Jib • Load block • Parts of line • Wedge socket assemblies • Boom hoist cylinders • Crawler tracks
2. Demonstrate knowledge of travel braking systems in crane operations	• Air compressor • Brake chambers • Drums • Brake shoes and pads • Slack adjusters

3. Describe defects or malfunctions of braking systems	• Air compressors • Brake chambers • Drums • Brake shoes and pads • Slack adjusters

Line (GAC): C CRANES

Competency: C3 Demonstrate knowledge of hoisting terminology, functions and systems

Objectives

To be competent in this area, the individual must be able to:

- Describe components and functions of hoisting systems.
- Describe defects and malfunctions.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of hoisting functions and systems for crane operation	• Components and their functions
	  ○ Hydraulic boom (extension/retraction, boom hoist cylinders)
	  ○ Lattice boom
	  ○ Drums
	  ○ Hooks
	  ○ Sheaves
	  ○ Winch
	  ○ Brakes and clutches
	  ○ Trolley
	  ○ Rollers
	  ○ Load block/overhaul ball
	  ○ Parts of line
	  ○ Load line
	• Defects or malfunctions
	  ○ Hydraulic boom (wear pads, cylinders, chain extended booms)
	  ○ Lattice boom
	  ○ Drums
	  ○ Hooks
	  ○ Sheaves
	  ○ Winch
	  ○ Brakes and clutches
	  ○ Trolley
	  ○ Rollers
	  ○ Load line

Line (GAC): C CRANES

Competency: C4 Demonstrate knowledge of regulatory requirements pertaining to cranes

Objectives

To be competent in this area, the individual must be able to describe current regulations and their impact on crane operations.

LEARNING TASKS	CONTENT
1. Demonstrate knowledge of how the regulations apply to the operation of cranes in a workplace	• WorkSafeBC Occupational Health and Safety Regulation (OHSR) • CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes • ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/ASME B30.22-2005, Articulating Boom Crane

Line (GAC): D RIGGING AND LIFTING THEORY

Competency: D1 Demonstrate knowledge of lifting theory and forces

Objectives

To be competent in this area, the individual must be able to describe the fundamentals of leverage.

LEARNING TASKS	CONTENT
1. Demonstrate knowledge of the principles of leverage	• Class 1 lever • Class 2 lever • Class 3 lever • Centre of gravity

Line (GAC): D RIGGING AND LIFTING THEORY

Competency: D2 Demonstrate knowledge of slings (all types), rigging hardware, materials, inspection and capacity cards

Objectives

To be competent in this area, the individual must be able to:

- Describe the types of slings and rigging hardware used in crane operations.
- Select the correct hitch configuration.
- Describe how to inspect and store slings and rigging hardware.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of slings and rigging hardware used in crane operations	• Slings
	  ○ Wire rope (construction used in manufacturing)
	  ○ Chain (grade of steel)
	  ○ Synthetic web slings (types and material used in manufacturing)
	  ○ Synthetic round slings (types and material used in manufacturing)
	• Hardware
	  ○ Hooks
	  ○ Shackles
	  ○ Eyebolts
	  ○ Wedge sockets
	• Hitch configurations
	  ○ Vertical
	  ○ Choker
	  ○ Basket
	  ○ Bridles
	• Below the hook lifting devices
	  ○ Spreader bars
	  ○ Equalizer beams
	  ○ Pallet forks
	  ○ Drywall lifters
	• Specific information from manufacturer's and rigging manuals

2. Demonstrate knowledge to assemble appropriate rigging for a given load according to manufacturer's ratings and to ensure the load can be lifted safely	• Selection of appropriate slings and rigging hardware
	  ○ Load weight determination
	  ○ Working load limit (WLL) calculations of slings and rigging hardware
	  ○ Sling and rigging hardware angle loading calculations
	• Selection of hitch and sling arrangement
	  ○ Use of correct hitch configuration
	  ○ Reduction of sling WLL when used at an angle

3. Demonstrate knowledge to inspect slings and rigging hardware	• Manufacturer's manuals and WorkSafeBC regulations • Excessive wear • Damage • Cracks • Missing safety clips • Broken wires • Labelling
4. Demonstrate knowledge to remove slings and rigging hardware from use	• Rejection criteria according to WorkSafeBC regulations and as per manufacturer's specifications • Removal from service if repair is not allowed • Destruction of rejected rigging • Requirements for reporting defects to appropriate personnel
5. Demonstrate knowledge to store slings and rigging hardware after use	• Storing criteria as per good practice

Line (GAC): D RIGGING AND LIFTING THEORY

Competency: D3 Demonstrate knowledge of wire rope hoist line construction and inspection

Objectives

To be competent in this area, the individual must be able to:

- Describe the characteristics and classifications of types of wire rope.
- Describe the inspection, maintenance and storage of wire rope.
- Describe the wire rope installation process.

LEARNING TASKS	CONTENT

1. Describe types of wire rope used in crane operation	• Characteristics, classifications and uses
	  ○ Conventional construction wire rope
	  ○ Anti-rotational wire rope
	  ○ Seale construction
	  ○ Filler construction
	  ○ Working load limit (WLL) of wire rope used in hoisting operations
	  ○ Breaking strength vs. Working load limit

2. Demonstrate knowledge of the process for inspection and replacement of wire ropes in accordance with manufacturer's recommendations	• Inspection and examination procedure
	  ○ Lubrication
	  ○ Excessive wear
	  ○ Bird caging
	  ○ Kinking
	  ○ Flattening
	  ○ Proper spooling
	  ○ Broken wires
	  ○ Distortion
	• Rejection criteria for damaged or defective rope according to WorkSafeBC regulations and manufacturer's specifications
	• Drum examination to ensure proper installation
	• Recording and reporting process for the inspection of defects and deficiencies
	  ○ Inspection recording in logbook
	  ○ Documentation of defects in logbook
	  ○ Requirements for reporting defects to supervisory personnel

3. Demonstrate knowledge of installing wire rope on a winch according to manufacturer's instructions	• Procedure for installing new wire rope on a winch • Winding direction • Proper spooling on drum • Wire rope system components

- Rope guides
- Drums
- Blocks
- Hooks
- Sheaves
- Wedge and socket termination
- Installing wedge sockets
- Reeving multi-part line blocks

4. Demonstrate knowledge of how to store wire rope
   - Manufacturer's requirements

5. Demonstrate knowledge of how to maintain wire rope
   - Lubrication
     - Inspection
     - Identification of rope needing lubrication
   - Manufacturer's specifications
     - Wire rope cutting and seizing
     - Cleaning
     - Lubrication
   - Wire rope maintenance recording in the logbook within the regulated timeframe

Line (GAC): D RIGGING AND LIFTING THEORY

Competency: D6 Use rigging hardware and tools in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Assemble rigging for a given load.
- Inspect, maintain and store slings and rigging hardware.

LEARNING TASKS	CONTENT
1. Assemble appropriate rigging for a given load to comply with Occupational Health and Safety Regulation (OHSR)	• Appropriate slings and rigging hardware for various lifts ○ Sling and rigging hardware selection ○ Load measurement ○ Load weight calculations ○ Sling requirement calculations ○ Hardware requirement calculations ○ Reduction of working load limit (WLL) due to sling angle and type of hitch ○ Protective equipment ○ Sling attachment to load to prevent slipping
2. Inspect, maintain and store slings and rigging hardware in workplace operations	• Manufacturer and company specifications

Achievement Criteria

Performance	Demonstrate competence using rigging hardware and tools.
Conditions	Trainee will be given a load(s) to be hoisted and a variety of rigging hardware to demonstrate the correct techniques for selection, assembly, maintenance and storage of rigging tools and hardware.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): E HOISTING FUNDAMENTALS

Competency: E1 Demonstrate knowledge of determining load weights using fundamental math functions and calculations

Objectives

To be competent in this area, the individual must be able to:

- Calculate load weights accurately.
- Interpret lift plans and load capacity charts.

Note: A scientific calculator is required for this unit

LEARNING TASKS	CONTENT
1. Demonstrate the functions of a scientific calculator to perform mathematical calculations	• Rounding off • Fractions • Metric and imperial units of measure • Circumference of a circle • Perimeter of an object • Surface area of an object • Pythagorean theorem
2. Demonstrate knowledge of accurately calculating load weights	• Volume of an object • Weight of a cubic unit of an object • Weight of materials • Total weight of load

3. Demonstrate ability to interpret engineering and worksite documentation	• Lift plans
	  ○ Capacity
	  ○ Boom configuration
	  ○ Load weight
	  ○ Rigging weight
	  ○ Calculations
	  ○ Radius of crane
	  ○ Positioning of crane
	  ○ Positioning of the load
	• Comparison of shipping company's bill of lading to a calculated weight based on volume, load monitoring and indicating systems and type of load to determine accuracy
	• Load capacity charts
	  ○ Gross capacity
	  ○ Net capacity
	  ○ Structural capacities
	  ○ Stability capacities

- Operating notes
- Capacities between listed chart values
- Quadrants of operation
- Outrigger position
- Deductions from gross capacity
- Operating radius
- Boom length
- Boom angle
- Main boom capacities
- Jib capacities
- Range diagrams
- Permissible line pull
- Load chart symbols

Line (GAC): E HOISTING FUNDAMENTALS

Competency: E2 Demonstrate knowledge of determining the capacity of a crane using load charts

Objectives

To be competent in this area, the individual must be able to select the appropriate configuration for a lift and determine the sufficient lifting capacity of a crane.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge to determine sufficient lifting capacity of a crane considering the configuration and attachments required for the lift	• Optimum boom configurations
	  ○ Boom length
	  ○ Boom angle
	  ○ Radius
	  ○ Hook height
	  ○ Quadrant
	• Selection of appropriate configurations
	  ○ Radius
	  ○ Parts of line
	  ○ Height of the combined load and rigging
	  ○ Weight of the combined load and rigging
	  ○ Boom length
	  ○ Boom jib combination
	  ○ Counterweight combination
	• Verification of configurations by the site supervisor and the crane supervisor
	  ○ Lift form completion as required by company
	• Differences between gross load and gross capacity
	• Static and dynamic loading and lifting principles

Line (GAC): E HOISTING FUNDAMENTALS

Competency: E3 Interpret load charts and load study drawings to configure crane for workplace operation

Objectives

To be competent in this area, the individual must be able to accurately identify and interpret information on a load chart and lift plan to configure a crane.

LEARNING TASKS	CONTENT
1. Configure crane appropriately after accurately interpreting load charts and lift plan or engineer's drawings	• Accurate interpretation • Verification of load dimensions by crane supervisor, crane operator (and engineer as required) • Centre of gravity of load • Special lift instructions
2. Identify and interpret lift plans accurately	• Capacity • Boom configuration • Load weight • Rigging weight • Calculations • Radius of crane • Positioning of crane • Positioning of the load

Achievement Criteria

Performance	Demonstrate competence interpreting load charts and lift plans to configure a crane.
Conditions	Trainee will be given a load(s) to be hoisted and the load charts and lift plans required to configure a crane for workplace operation.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): H CRANE OPERATIONS

Competency: H1 Demonstrate knowledge of pre-operational requirements in crane operations

Objectives

To be competent in this area, the individual must be able to:

- Describe pre-operational inspection procedures.
- Describe tests and required maintenance and repairs.
- Describe the process of accurately recording and reporting defects and deficiencies.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of the pre-operational inspection procedures recommended for a mobile crane, a boom truck and a tower crane	• Inspection procedures
	  ○ Operator aids in place
	  ○ WorkSafeBC Occupational Health and Safety Regulation (OHSR) requirements followed
	  ○ Manufacturer's specifications are followed
	  ○ Control and safety devices
	• Location and verification of operator aids
	  ○ Load monitoring and indicating system
	  ○ Boom length indicator (if applicable)
	  ○ Boom angle indicator
	  ○ Load radius indication (as part of LMI system)
	  ○ Anti-two block
	  ○ Crane manual
	  ○ Load charts
	  ○ Range diagram
	  ○ Work area diagram
	• Completion and filing of inspection and erection reports
	  ○ Crane logbook

2. Demonstrate knowledge of tests, repairs and maintenance required during the pre-operation inspection stage	• Function tests on hoist systems
	  ○ Boom up
	  ○ Boom down (if applicable)
	  ○ Hoist up
	  ○ Hoist down
	  ○ Swing left
	  ○ Swing right
	  ○ Boom retraction (if applicable)
	  ○ Boom extension (if applicable)
	  ○ Brakes
	• Service and maintenance prior to operation according to manufacturer's requirements
	• Documentation of service and maintenance in the crane logbook

3. Demonstrate knowledge of reports and records required for reporting deficiencies or defects	• Process of accurate reporting to the supervisor and proper documentation in the crane logbook
	  ○ Date
	  ○ Description of defect/deficiency
	  ○ Signature of person identifying the defect/deficiency
	  ○ Legal requirements entries compliant with WorkSafeBC regulations and any other applicable regulatory agency codes, laws and guidelines
	• Process for recording repair and maintenance in the appropriate crane logbook
	  ○ Date
	  ○ Description of repair or maintenance
	  ○ Signature of person performing maintenance or repairs

4. Demonstrate knowledge of the setup procedures for mobile cranes, boom trucks and Tower Crane

- Manufacturer's specifications, the relevant standard and the Occupational Health and Safety Regulation (OHSR)
  - Site assessment
- Obstructions
  - Electrical power lines
  - Trees
- Bearing surface hazards
  - Underground services
  - Underground building structures
  - Soil/support bearing capacity
- Requirements for blocking and mats to be sufficient considering the load requirements and surface conditions to level the crane
  - Soil types
  - Calculation of bearing pressure
  - Estimation of outrigger loads
  - Blocking requirements
  - Blocking methods
- Programming and adjustment of safety devices to ensure accuracy and safety while lifting
  - LMI (load monitoring and indicating systems)
  - Anti two block systems
  - Boom angle indicators
- Crane levelling
  - Spirit levels
  - Plumb load line
  - Equal load on all outriggers

Line (GAC): H CRANE OPERATIONS

Competency: H8 Conduct pre-operational inspections of mobile cranes and equipment in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Perform a pre-operational inspection.
- Perform required tests, maintenance and repairs.
- Report and record defects and malfunctions.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of the pre-operational inspection procedures recommended for a mobile crane	• Inspection procedures
	  ○ Operator aids in place
	  ○ Inspection reports completed
	  ○ WorkSafeBC Occupational Health and Safety Regulation (OHSR) and requirements followed
	  ○ Manufacturer's specifications are followed
	• Location and verification of operator aids
	  ○ Load monitoring and indicating system
	  ○ Boom length indicator (if applicable)
	  ○ Boom angle indicator
	  ○ Load radius
	  ○ Anti-two block
	  ○ Crane manual
	  ○ Load charts
	  ○ Range diagram
	  ○ Work area diagram

2. Perform tests, repairs and maintenance required during the pre-operation inspection	• Function test of operating controls
	  ○ Boom up
	  ○ Boom down
	  ○ Hoist up
	  ○ Hoist down
	  ○ Swing left
	  ○ Swing right
	  ○ Boom retraction (does not apply to lattice boom cranes)
	  ○ Boom extension (does not apply to lattice boom cranes)
	  ○ Brakes
	• Repair and maintenance completion prior to

operation according to manufacturer's requirements
- Documentation of repairs and maintenance in the crane logbook

3. Demonstrate the use of reports and records required for reporting deficiencies or defects

- Accurate reporting to the supervisor and proper documentation in the crane logbook
  - Date
  - Description of defect/deficiency
  - Signature of operator
  - Description of the repair effected
  - Signature of person doing the repairs
  - Legal requirements entries compliant with WorkSafeBC regulations and any other applicable regulatory agency codes, laws and guidelines

4. Conduct the setup procedures for a mobile crane

- Manufacturer's specifications and Occupational Health and Safety Regulation (OHSR)
- Overhead obstructions and underground hazards
  - Electrical power lines
  - Trees
  - Underground services
  - Underground parking/space structures
  - Other equipment or structures
- Requirements for blocking and mats to be sufficient considering the load requirements and surface conditions to level the crane
- Safety device programming and adjustment to ensure accuracy and safety while lifting
  - Load monitoring and indicating system
  - Anti-two block systems
  - Boom angle indicators

Achievement Criteria

Performance	Demonstrate competence conducting pre-operational inspections of mobile cranes and equipment.
Conditions	Trainee will be given a project(s) and the tools and materials to perform the required tests, repairs and maintenance on a crane during a pre-operational inspection.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): H CRANE OPERATIONS

Competency: H9 Conduct safe crane set-up according to manufacturer's specifications

Objectives

To be competent in this area, the individual must be able to follow set-up procedures accurately in accordance with manufacturer's specifications.

LEARNING TASKS	CONTENT
1. Conduct the set-up of a crane	• Hazard/site assessment • Access route walking • Level and compacted access route • Level and compacted crane set-up area • Movement of crane into position • Barriers and signage as required • Radius to placement/removal of load • Outrigger beams/track frames extension as per manufacturer's instructions • Outrigger beams marked to show full/partial extension • Placement of sufficient sized mats/pads under outriggers/crawlers • Ends of crawlers blocked if required • Outriggers extended to level crane • Grounding/bonding of crane if required • 360 degree upperworks rotation to check for swing clearance • Level of crane rechecking

Achievement Criteria

Performance	Demonstrate competence conducting safe crane set-up according to manufacturer's specifications.
Conditions	Trainee will be given a project(s) and the tools and materials required to assess a site and follow procedures to set-up a crane in accordance with manufacturer's specifications.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I1 Maintain an equipment logbook to retain a permanent written record of maintenance and repairs

Objectives

To be competent in this area, the individual must be able to record all inspections, defects, deficiencies and maintenance in an equipment logbook.

LEARNING TASKS	CONTENT
1. Record all inspections and maintenance in an equipment logbook	• Legible and easily understood • Complete and accurate entries • Completed inspections • Requests for the external supply of maintenance • Completed maintenance
2. Report all inspections, defects, deficiencies, and maintenance to the crane supervisor and site supervisor	• Clear and easy to understand communication • Reporting requirements at the time of the inspection, request or maintenance

Achievement Criteria

Performance	Demonstrate competence maintaining an equipment logbook.
Conditions	Trainee will be given a project(s) and the information required to record all inspections and maintenance in an equipment logbook, ensuring entries are legible and easy to understand.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Level 2

Boom Truck Operator –

Stiff Boom Unlimited Tonnage

Line (GAC): C CRANES

Competency: C5 Demonstrate knowledge of crane components and attachments for boom trucks

Objectives

To be competent in this area, the individual must be able to identify crane components and attachments for boom trucks, explain their purpose and describe defects and malfunctions.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of carriers, trucks and undercarriages	• Components
	  ○ Suspension
	  ○ Wheels
	  ○ Tires
	  ○ Hydraulic motors
	• Defects and malfunctions
	  ○ Cracked frame
	  ○ Cracked welds
	  ○ Broken drive line shafts
	  ○ Damaged wheels
	  ○ Damaged differentials
	  ○ Tires
	  ○ Loose/broken fasteners, bolts, washers

2. Demonstrate knowledge of outrigger and stabilizing equipment	• Outrigger beams • Outrigger jacks • Outrigger pads • Retaining pins • Hydraulic hoses • Holding valves

3. Demonstrate knowledge of the turntable and turret on a variety of boom trucks	• Components
	  ○ Bearings
	  ○ Bolts
	  ○ Gears
	  ○ Swing gear
	• Functions
	  ○ Bearings
	  ○ Bolts
	  ○ Gears
	  ○ Swing gear
	• Defects and malfunctions

- Loose, cracked, missing bolts
- Structural cracks
- Damage

4. Demonstrate knowledge of attachments for boom trucks

- Attachments
  - Boom extensions
  - Jibs
- Functions
  - Boom extensions
  - Jibs
- Defects or malfunctions
  - Boom extensions
  - Jibs

5. Demonstrate knowledge of crane safety components, devices and aids

- Component devices and aids
  - Load monitoring and indicating systems/Rated Capacity Indicator (RCI)
  - Anti-two block devices (when winch is installed)
  - Boom length indicators
  - Boom angle indicator
- On-board crane operator aids
  - Load charts
  - Operators' manuals
  - Operator logbook
- Overload Prevention Systems
- Defects or malfunctions
  - Load monitoring and indicating system /Rated Capacity Indicator (RCI)
  - Anti-two block devices (when winch is installed)
  - Boom length indicators
  - Boom angle indicator
- Safety device malfunction
  - Requirements for reporting to supervisory personnel
  - Logbook entry
  - Crane operation suspension if necessary

6. Demonstrate knowledge of suspended/pinned work platforms	• Trial lift • Safety factor of rigging • Fall protection requirements • Crane capacity to be downrated when lifting personnel (safety factor required) • Platforms must be engineered to meet standard • Anti-two block system • Critical lift requirements

Line (GAC): C CRANES

Competency: C6 Demonstrate knowledge of engines and ancillary systems

Objectives

To be competent in this area, the individual must be able to:

- Describe the types of engines and fuels.
- Describe the components, functions and defects of drive systems.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of engines	• Types of engines and relevant fuels used
	  ○ Diesel
	  ○ Propane
	  ○ LNG
	  ○ Gasoline

2. Demonstrate knowledge of crane drive systems	• Components and their functions
	  ○ Clutch
	  ○ Transmission
	  ○ Differentials
	  ○ Power take-offs
	  ○ Hydraulic motors
	• Defects or malfunctions
	  ○ Clutch
	  ○ Transmission
	  ○ Differentials
	  ○ Power take-offs
	  ○ Hydraulic motors

Line (GAC): C CRANES

Competency: C7 Demonstrate knowledge of power transfer for boom trucks

Objectives

To be competent in this area, the individual must be able to describe pneumatic, hydraulic, electrical, steering and braking systems in crane operations.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of pneumatic systems in crane operations	• Components and their functions
	  ○ Air brakes
	  ○ Horn
	  ○ Seats
	  ○ Air control levers
	• Defects or malfunctions
	  ○ Air brakes
	  ○ Horn
	  ○ Seats
	  ○ Air control levers

2. Demonstrate knowledge of hydraulic systems in crane operations	• Components and their functions
	  ○ Hydraulic fluid
	  ○ Filters
	  ○ Lines
	  ○ Pumps
	  ○ Motors
	  ○ Fittings
	  ○ Hydraulic control levers
	• Defects or malfunctions
	  ○ Hydraulic fluid
	  ○ Filters
	  ○ Lines
	  ○ Pumps
	  ○ Motors
	  ○ Fittings
	  ○ Hydraulic control levers

3. Demonstrate knowledge of electrical systems in boom crane operations	• Components and their functions
	  ○ Alternator
	  ○ Starter
	  ○ Wiring
	  ○ Fuses
	  ○ Limit switches
	  ○ Electric motors
	• Defects or malfunctions
	  ○ Alternator
	  ○ Starter
	  ○ Wiring
	  ○ Fuses
	  ○ Limit switches
	  ○ Electric motors

4. Demonstrate knowledge of steering system components in boom trucks	• Components and their functions
	  ○ Axles
	  ○ Tie rods
	  ○ Steering box
	  ○ Ball joints
	• Defects or malfunctions
	  ○ Axles
	  ○ Tie rods
	  ○ Steering box
	  ○ Ball joints

5. Demonstrate knowledge of travel braking systems in boom truck	• Components and their functions
	  ○ Air compressor
	  ○ Brake chambers
	  ○ Drums
	  ○ Brake shoes and pads
	  ○ Slack adjusters
	• Defects or malfunctions
	  ○ Air compressors
	  ○ Brake chambers
	  ○ Drums
	  ○ Brake shoes and pads
	  ○ Slack adjusters

Line (GAC): F TRANSPORTATION AND DELIVERY

Competency: F1 Demonstrate knowledge of BC Ministry of Transportation – Commercial Transport rules and regulations

Objectives

To be competent in this area, the individual must be able to describe sections of the BC Ministry of Transportation – Commercial Transport Regulations relevant to the travel and transport of a crane and its components.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of legislation and regulations to travel or transport a crane on public highways according to the BC Ministry of Transportation - Commercial Transport Regulations	• Related sections of the BC Ministry of Transportation - Commercial Transport Regulations for the travel and transportation of boom trucks, mobile cranes and components
	• Criteria for special permits
	  ○ Overall height
	  ○ Overall weight
	  ○ Overall length
	  ○ Total axle weight

Line (GAC): F TRANSPORTATION AND DELIVERY

Competency: F2 Demonstrate knowledge to prepare a boom truck and associated loads for highway/road travel

Objectives

To be competent in this area, the individual must be able to explain the procedure and requirements to safely prepare a boom truck and its components for highway/road travel in accordance with the BC Ministry of Transportation – Commercial Transport Regulations.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge to prepare a boom truck and its components for highway travel in accordance with manufacturer's recommendations and the BC Ministry of Transportation – Commercial Transport Regulations	• Requirements
	  ○ Flags
	  ○ Lights
	  ○ Permits
	  ○ Wheel chocks
	• Procedure
	  ○ Boom retraction
	  ○ Outrigger beam retraction and pinning
	  ○ Outrigger pad removal
	  ○ Swing brake and lock application (if applicable)
	  ○ Hook to tie down securing (if applicable)
	• Correct and serviceable signage and signals
	  ○ Manufacturer's procedures
	  ○ BC Ministry of Transportation - Commercial Transport Regulations
	  ○ Flags
	  ○ Flashers
	  ○ Warning signs
	• Verification of permits for a boom truck
	  ○ Correct permit present where applicable

Line (GAC): F TRANSPORTATION AND DELIVERY

Competency: F4 Prepare and transport a mobile crane to a worksite following all highway and traffic rules and regulations

Objectives

To be competent in this area, the individual must be able to safely load and secure a crane and its components for transport following manufacturer's recommendations and the BC Ministry of Transportation – Commercial Transport Regulations.

LEARNING TASKS	CONTENT

1. Prepare crawler cranes and rubber-tired cranes and components for highway travel following manufacturer's recommendations and the BC Ministry of Transportation - Commercial Transport Regulations	• Safe loading and securing of the crane and components for transporter travel displaying correct and serviceable signage and signals
	  ○ Manufacturer's recommendations
	  ○ BC Ministry of Transportation - Commercial Transport Regulations
	  ○ Security of components
	  ○ Flags
	  ○ Flashers
	  ○ Warning signals
	  ○ Permit verification

Achievement Criteria

Performance	Demonstrate competence preparing and transporting a mobile crane to a worksite following all highway and traffic rules and regulations.
Conditions	Trainee will be given a project(s) and the tools and materials required to demonstrate the correct procedure for safely loading and securing a mobile crane and its components for transport to a worksite following all highway and traffic rules and regulations.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): F TRANSPORTATION AND DELIVERY

Competency: F6 Prepare a boom truck and associated loads for highway/road travel

Objectives

To be competent in this area, the individual must be able to demonstrate the procedure to safely secure and prepare a boom truck and its components for highway travel following manufacturer's recommendations and the BC Ministry of Transportation – Commercial Transport Regulations.

LEARNING TASKS	CONTENT

1. Demonstrate the skills to prepare a boom truck and its components for highway travel in accordance with manufacturer's recommendations and the BC Ministry of Transportation – Commercial Transport Regulations	• Requirements
	  ○ Flags
	  ○ Lights
	  ○ Permits
	  ○ Wheel chocks
	• Procedure
	  ○ Boom retraction
	  ○ Outrigger beam retraction and pinning (if applicable)
	  ○ Outrigger pad removal (if applicable)
	  ○ Swing brake and lock application (if applicable)
	  ○ Hook to tie down securing (if applicable)
	• Correct signage
	  ○ Manufacturer's procedures
	  ○ BC Ministry of Transportation - Commercial Transport Regulations
	  ○ Flags
	  ○ Flashers
	  ○ Warning signs
	• Verification of permits for a boom truck is shown
	  ○ Applicable permit present for boom truck

Achievement Criteria

Performance	Demonstrate competence preparing a boom truck and associated loads for highway/road travel.
Conditions	Trainee will be given a project(s) and the tools and materials required to prepare a boom truck and its components for travel in accordance with manufacturer's recommendations and the BC Ministry of Transportation – Commercial Transport Regulations.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): G SITE PLANNING AND CRANE POSITIONING

Competency: G1 Demonstrate knowledge of accurate site assessment tools

Objectives

To be competent in this area, the individual must be able to explain the purpose of site plans and describe the elements of a standard lift plan.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge of lift plans	• Purpose of site plans and engineering drawings in preparing lift plans
	  ○ Placement of load
	  ○ Placement of crane
	  ○ Grade to be travelled on
	  ○ Structural integrity of the area
	  ○ Ground bearing capacity of the area
	• Elements of a standard lift plan
	  ○ Routine to move load
	  ○ Crane capacity requirements to pick, move and place the load
	  ○ Maximum allowable travel grade according to crane manufacturer specifications
	  ○ Travel path walking to evaluate hazards
	  ○ Signal person
	  ○ Rigging required
	  ○ Horn or backup alarm
	  ○ Signed by operator
	  ○ Signed by supervisor
	  ○ Critical lift
	  ○ Tandem lift

Line (GAC): G SITE PLANNING AND CRANE POSITIONING

Competency: G2 Demonstrate knowledge to locate and safely position a crane

Objectives

To be competent in this area, the individual must be able to describe site conditions and load placement considerations when positioning a crane.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge to establish the location of a crane on a work site	• Site conditions and hazard assessment
	  ○ Accessibility of site
	  ○ Grade of site
	  ○ Soil conditions and compaction
	  ○ Distance to embankments
	  ○ Initial location of load
	  ○ Final placement of load
	  ○ Proximity of other equipment
	  ○ Overhead obstructions
	  ○ Distance to electrical power lines
	  ○ Known underground hazards
	  ○ Weather conditions
	• Load placement considerations and potential hazards
	  ○ Initial location of load
	  ○ Load path
	  ○ Final placement of load
	  ○ Proximity of other equipment
	  ○ Overhead obstructions
	  ○ Distance to electrical power lines
	  ○ Known underground hazards
	  ○ Weather conditions

2. Demonstrate knowledge of blocking to be used according to soil conditions	• Blocking requirements according to soil types • Proper blocking methods
3. Demonstrate knowledge of communication required during crane and load positioning	• Signal persons (line of sight) • Radio communications (blind, multi-crane or poor visibility) • Traffic control

4. Demonstrate knowledge of barriers and signage required in a worksite	• Clearance between the counterweight of crane and any fixed object • Traffic control • Pedestrian • Audible warning when lifting overhead
5. Demonstrate knowledge of grounding and bonding of a crane at a worksite	• Procedures and requirements according to local power authority

Line (GAC): G SITE PLANNING AND CRANE POSITIONING

Competency: G3 Conduct an accurate site assessment and safely position a crane in the workplace

Objectives

To be competent in this area, the individual must be able to develop an accurate lift plan for the site and safely position a crane.

LEARNING TASKS	CONTENT

1. Inspect a site and develop an accurate lift plan using blueprints and an engineered drawing	• Lift plan
	  ○ Assessment of area and soil condition
	  ○ Assessment of hazards
	  ○ Assessment of obstacles
	  ○ Overhead hazards
	  ○ Underground utilities
	  ○ Travel path walking
	  ○ Traffic control established
	  ○ Load weight
	  ○ Rigging required, rigging weight, rigging certified
	  ○ Lift supervisor or signal person competent
	  ○ Crane capacity sufficient for load throughout the lift
	  ○ Critical lift
	  ○ Tandem lift
	• Location and positioning of the crane is safe and correct
	  ○ Blocking and blocking mats
	  ○ Signalling and barrier signage
	  ○ Grounding and bonding

Achievement Criteria

Performance	Demonstrate competence conducting an accurate site assessment and safely positioning a crane.
Conditions	Trainee will be given a project(s), blueprints and an engineered drawing to conduct a site assessment and develop an accurate lift plan to safely position a crane.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): G SITE PLANNING AND CRANE POSITIONING

Competency: G7 Conduct an accurate site assessment and safely position a boom truck with a folding boom (unlimited tonnage) in the workplace

Objectives

To be competent in this area, the individual must be able to develop an accurate lift plan for the site and safely position a boom truck with a folding boom (unlimited tonnage) crane.

LEARNING TASKS	CONTENT

1. Inspect a site and develop an accurate lift plan	• Lift plan
	  ○ Assessment of area and soil condition
	  ○ Assessment of hazards
	  ○ Assessment of obstacles
	  ○ Overhead hazards
	  ○ Underground utilities
	  ○ Proximity to slopes
	  ○ Proximity to excavations
	  ○ Ground stability and drainage
	• Location and positioning of boom truck and crane boom is safe and correct
	  ○ Blocking and blocking mats
	  ○ Signalling and barrier signage
	  ○ Grounding and bonding

Achievement Criteria

Performance	Demonstrate competence conducting an accurate site assessment and safely positioning a boom truck with a folding boom (unlimited tonnage) crane.
Conditions	Trainee will be given a project(s), blueprints and an engineered drawing to conduct a site assessment and develop an accurate lift plan to safely position a folding boom (unlimited tonnage) crane.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): G SITE PLANNING AND CRANE POSITIONING

Competency: G11 Conduct an accurate site assessment and safely position a boom truck with a stiff boom (unlimited tonnage) in the workplace

Objectives

To be competent in this area, the individual must be able to develop an accurate lift plan for the site and safely position a boom truck with a stiff boom (unlimited tonnage) crane.

LEARNING TASKS	CONTENT

1. Inspect a site and develop an accurate lift plan	• Lift plan
	  ○ Assessment of area and soil condition
	  ○ Assessment of hazards
	  ○ Proximity to excavations and slopes
	  ○ Assessment of obstacles
	  ○ Overhead hazards
	  ○ Underground utilities
	• Location and positioning of boom truck is safe and correct
	  ○ Blocking and blocking mats
	  ○ Signalling and barrier signage
	  ○ Grounding and bonding

Achievement Criteria

Performance	Demonstrate competence conducting an accurate site assessment and safely positioning a boom truck with a stiff boom (unlimited tonnage) crane.
Conditions	Trainee will be given a project(s), blueprints and an engineered drawing to conduct a site assessment and develop an accurate lift plan to safely position a stiff boom (unlimited tonnage) crane.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): H CRANE OPERATIONS

Competency: H2 Demonstrate knowledge of crane operations

Objectives

To be competent in this area, the individual must be able to:

- Describe the safe and correct operation of a crane with and without a load.
- Describe maintaining safe control of a crane under varying weather conditions.
- Describe monitoring equipment performance during operation.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge to correctly operate a crane without and with a load	• Without a load
	  ○ Booming up and booming down
	  ○ Swinging/slewing clockwise and counter clockwise
	  ○ Hoisting up and down
	  ○ Travelling on site (if allowed)
	  ○ Quadrants of operation
	  ○ Levelling the crane
	  ○ Use of outriggers/stabilizers
	  ○ Reference to load chart
	• With a load
	  ○ Booming up and booming down
	  ○ Swinging/slewing clockwise and counter clockwise
	  ○ Hoisting up and down
	  ○ Travelling on site (if allowed)
	  ○ Picking and placing a load accurately and smoothly
	  ○ Quadrants of operation
	  ○ Levelling crane
	  ○ Use of outriggers/stabilizers
	  ○ Reference to load chart

2. Demonstrate knowledge of safe control under varying weather conditions
   - Effects on lifting
     - Ice
     - Cold temperatures
     - Wind
     - Lightning storm
     - Poor visibility due to environmental conditions
   - Techniques to maintain control of the crane
     - Even control
     - Smooth engagement of levers
     - Slower swing speeds

3. Demonstrate knowledge of safely and efficiently moving and placing a load at its intended destination
   - Signal person
   - Obstacle avoidance
   - Load properly rigged
   - Load line to remain vertical while load is being moved
   - Load to be lifted and placed slowly to minimize dynamic loading
   - Smooth, controlled movement
   - Crane within capacity throughout the lift
   - Load safely supported before being removed from crane hook

4. Demonstrate knowledge to monitor equipment performance and troubleshoot problems while using a crane
   - Water levels
   - Oil fluid levels
   - Hydraulic levels
   - Instrument gauges
   - Troubleshooting according to manufacturer's specifications

5. Demonstrate knowledge of hoisting procedures
   - Hoisting procedures
     - Critical lifts
     - Multi-crane lifts
     - Suitable rigging
     - Hoisting from lower to higher capacity quadrants
   - Pick and carry procedures permitted by manufacturer
     - Slow travel speed
     - Shortest boom length possible
     - Load as low as possible
     - Boom oriented as specified by the manufacturer
     - Load restrained from swinging

- Procedures for operating in the vicinity of high voltage equipment according to local utility authority and limits of approach
  - Safety watcher
  - Assurance in writing
  - Critical lifts (lifting over lines)
- Blind lift
  - Use of radio when signal person not visible
  - Use of second signal person when one is not visible
- Hoisting personnel
  - Procedures outlined in WorkSafeBC Occupational Health and Safety Regulation (OHSR)
- Procedures for moving a load as part of a multi-crane lift/critical lift
  - Lift plan
  - Lift plan meeting
  - Rigging plan
  - Requirement for supervision by someone other than one of the crane operators

6. Demonstrate knowledge of post-operational procedure

- Load and rigging removal from hook
- Hook block elevation
- Safe boom positioning
- Wheels/tracks and attachments cleaning requirements
- Appropriate/safe location for parking and securing equipment
- Equipment shutdown
- Equipment securing requirements
  - Lockup
  - Battery disconnection
- Housekeeping tasks
  - Deck is clean
  - Cab is clean
  - Rubbish/obstacles in cab are removed
- Post-operation inspection
  - Fluid levels
  - Shutdown
  - Lockup
  - Appropriate location

Line (GAC): H CRANE OPERATIONS

Competency: H3 Demonstrate knowledge of lifting plans and rigging for cranes

Objectives

To be competent in this area, the individual must be able to:

- Describe configurations and attachments required for a lift.
- Describe the selection of slings and rigging hardware.

LEARNING TASKS	CONTENT

1. Demonstrate knowledge to determine sufficient lifting capacity of a crane considering the configuration and attachments required for the lift	• Optimum boom configurations
	  ○ Boom length
	  ○ Boom angle
	  ○ Radius
	  ○ Hook height
	  ○ Quadrant
	• Configurations appropriate for lifting loads
	  ○ Radius
	  ○ Parts of line
	  ○ Height of the combined load and rigging
	  ○ Weight of the combined load and rigging
	  ○ Boom length
	  ○ Boom jib combination
	• Verification of configurations for the lift
	  ○ Supervisory personnel
	  ○ Engineer
	  ○ Completion of lift forms as required by the company
	• Differences between gross load and gross capacity
	• Static and dynamic loading and lifting principles

2. Demonstrate knowledge of selection of slings and rigging hardware to safely lift loads	• Load configuration determination
	  ○ Calculations for slings and rigging hardware
	  ○ Calculations of loads
	• Load height, weight, length and width verification
	• Centre of gravity calculations for a load
	• Working Load Limit (WLL) calculation and usage for wire rope and slings and rigging hardware
	• Hardware selection according to manufacturer's requirements
	  ○ Weight

  - Size of load
- Criteria for selecting the appropriate safety devices
  - Shape
  - Weight
  - Sharp edges of load
  - Round edges of load
- Load calculation on slings of unequal length (if required)
  - Weight of load
  - Centre of gravity
  - Sling angles
  - Dimension of the load (height, weight, length)

Line (GAC): H CRANE OPERATIONS

Competency: H4 Demonstrate knowledge of folding boom (unlimited tonnage) load charts and load calculations

Objectives

To be competent in this area, the individual must be able to interpret folding boom (unlimited tonnage) load charts accurately.

LEARNING TASKS	CONTENT
1. Demonstrate knowledge of load charts	• Accurate interpretation • Verification of load dimensions by crane supervisor, crane operator (and engineer as required) • Special lift instructions

2. Demonstrate knowledge of safe control of the load according to conditions	• Weather conditions and their effects on lifting
	  ○ Ice
	  ○ Load frozen to the ground
	  ○ High winds
	  ○ Lightning storm
	• Techniques to maintain control of the crane
	  ○ Smooth engagement of the controls
	  ○ Slower swing speeds
	  ○ Awareness of the effect of slewing speed on load and boom swing radius

Line (GAC): H CRANE OPERATIONS

Competency: H5 Demonstrate knowledge of stiff boom (unlimited tonnage) load charts and load calculations

Objectives

To be competent in this area, the individual must be able to interpret stiff boom (unlimited tonnage) load charts accurately.

LEARNING TASKS	CONTENT
1. Demonstrate knowledge of load charts	• Accurate interpretation • Verification of load dimensions by crane supervisor, crane operator (and engineer as required) • Special lift instructions

2. Demonstrate knowledge of safe control of the load according to conditions	• Weather conditions and their effects on lifting
	  ○ Ice
	  ○ Load frozen to the ground
	  ○ High winds
	  ○ Lightning storm
	• Techniques to maintain control of the crane
	  ○ Smooth engagement of the controls
	  ○ Slower swing speeds
	  ○ Awareness of the effect of slewing speed on load and boom swing radius

Line (GAC): H CRANE OPERATIONS

Competency: H10 Operate a boom truck with a folding boom (unlimited tonnage) to lift and place loads in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Operate a boom truck with a folding boom (unlimited tonnage) with and without a load.
- Maintain safe control of a crane under varying weather conditions.
- Monitor equipment performance and troubleshoot problems during operation.

LEARNING TASKS	CONTENT

1. Correctly operate the boom crane with and without a load according to manufacturer's specifications	• Without a load
	  ○ Booming procedures (up and down)
	  ○ Swinging/slewing
	  ○ Hoisting procedures (up and down) when equipped with hoist
	  ○ Travelling to site prior to set-up
	• With a load
	  ○ Booming procedures (up and down)
	  ○ Swinging/slewing
	  ○ Hoisting procedures (up and down) when equipped with hoist

2. Adjust procedures according to conditions and maintain safe control of the crane	• Adjustments for weather conditions (may be performed in a simulated environment)
	  ○ Ice
	  ○ Frozen to the ground
	  ○ High winds
	  ○ Lightning storm
	• Techniques to maintain control of the crane
	  ○ Even control
	  ○ Slower swing speeds

3. Perform equipped lift using a boom truck with a folding boom following manufacturer's recommendations and following all safety regulations	• Crane operations in the vicinity of high voltage equipment according to local utilities and limits of approach in a simulated environment • Blind lift ○ Use of radio when signal person not visible

4. Monitor equipment performance and troubleshoot problems while using a crane	• Water levels • Oil fluid levels • Hydraulic levels • Instrument gauges • Troubleshooting according to manufacturer's specifications
5. Safely and efficiently lift and place loads at their intended destination	• Signal person • Obstacles • Right destination

6. Perform post-operational procedures	• Wheel and attachment cleaning
	• Appropriate/safe location for parking and securing equipment
	• Equipment shutdown
	• Equipment securing requirements
	  ○ Lockup
	  ○ Battery disconnect (switch)
	• Housekeeping tasks
	  ○ Deck cleaning
	  ○ Cab cleaning
	  ○ Rubbish/obstacle removal from cab
	• Inspection
	  ○ Fluid levels
	  ○ Shutdown
	  ○ Lock up
	  ○ Appropriate location

Achievement Criteria

Performance	Demonstrate competence operating a boom truck with a folding boom (unlimited tonnage).
Conditions	Trainee will be given a project(s) and the tools and materials required to operate and maintain safe control of a boom truck with a folding boom (unlimited tonnage) to lift and place loads safely and efficiently.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): H CRANE OPERATIONS

Competency: H11 Operate a boom truck with a stiff boom (unlimited tonnage) to lift and place loads in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Operate a boom truck with a stiff boom (unlimited tonnage) with and without a load.
- Maintain safe control of a crane under varying weather conditions.
- Monitor equipment performance and troubleshoot problems during operation.

LEARNING TASKS	CONTENT

1. Correctly operate the boom crane with and without a load according to manufacturer's specifications	• Without a load
	  ○ Booming procedures (up and down)
	  ○ Swinging/slewing
	  ○ Hoisting procedures (up and down)
	  ○ Travelling to site prior to set up
	• With a load
	  ○ Booming procedures (up and down)
	  ○ Swinging/slewing
	  ○ Hoisting procedures (up and down)

2. Adjust procedures according to conditions and maintain safe control of the crane	• Adjustments for weather conditions (may be performed in a simulated environment)
	  ○ Ice
	  ○ Frozen to the ground
	  ○ High winds
	  ○ Lightning storm
	• Techniques to maintain control of the crane
	  ○ Even control
	  ○ Slower swing speeds

3. Perform equipped lift using a boom truck with a stiff boom following manufacturer's recommendations and following all safety regulations	• Crane operations in the vicinity of high voltage equipment according to local utilities and limits of approach in a simulated environment • Blind lift ○ Use of radio when signal person not visible
4. Monitor equipment performance and troubleshoot problems while using a crane	• Water levels • Oil fluid levels • Hydraulic levels • Instrument gauges • Troubleshooting according to manufacturer's specifications

5. Safely and efficiently lift and place loads at their intended destination	• Signal person • Obstacles • Right destination

6. Perform post-operational procedures	• Wheel and attachment cleaning
	• Appropriate/safe location for parking and securing equipment
	• Equipment shutdown
	• Equipment securing requirements
	  ○ Lockup
	  ○ Battery disconnection (switch)
	• Housekeeping tasks
	  ○ Deck cleaning
	  ○ Cab cleaning
	  ○ Rubbish/obstacle removal from cab
	• Inspection
	  ○ Fluid levels
	  ○ Shutdown
	  ○ Lock up
	  ○ Appropriate location

Achievement Criteria

Performance	Demonstrate competence operating a boom truck with a stiff boom (unlimited tonnage).
Conditions	Trainee will be given a project(s) and the tools and materials required to operate and maintain safe control of a boom truck with a stiff boom (unlimited tonnage) to lift and place loads safely and efficiently.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): H CRANE OPERATIONS

Competency: H13 Leave a mobile crane unattended

Objectives

To be competent in this area, the individual must be able to:

- Leave a crane unattended for short and long periods of time.
- Perform shutdown procedures.

LEARNING TASKS	CONTENT

1. Leave a crane unattended for short and long periods of time	• Short periods of time (lunch breaks etc.)
	  ○ No load on the hook
	  ○ Hook elevation
	  ○ Ignition off and removal of key
	  ○ Swing brake application
	  ○ Swing dogs application (if applicable)
	  ○ Crane left in working position
	• Long periods of time (overnight, weekends etc.)
	  ○ No load on the hook
	  ○ Boom lowering to blocking or in cradle
	  ○ Ignition off and removal of key
	  ○ Swing brake application
	  ○ Swing dogs application (if applicable)

2. Perform the shutdown procedures for a mobile crane	• Company requirements for wheels/tracks and attachment cleaning
	• Appropriate location for parking
	• Shutdown
	• Crane securing requirements
	  ○ Lockup
	  ○ Battery/night switch disconnection
	• Housekeeping tasks according to the company's standard requirements
	  ○ Deck cleaning
	  ○ Cab cleaning
	  ○ Rubbish/obstacle removal from cab
	• Inspection
	  ○ Fluid levels
	  ○ Shutdown
	  ○ Lock up
	  ○ Appropriate location

Achievement Criteria

Performance	Demonstrate competence leaving a mobile crane unattended.
Conditions	Trainee will be given a project(s) and the tools and materials required to demonstrate the procedures for shutting down and leaving a crane unattended for short and long periods of time.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I2 Demonstrate knowledge of inspecting engines, monitoring devices and hydraulic systems

Objectives

To be competent in this area, the individual must be able to:

- Describe the tools required for basic crane maintenance and explain their functions.
- Describe the process of inspecting engines, monitoring devices and hydraulic systems.

LEARNING TASKS	CONTENT
1. Demonstrate knowledge of tools required to perform basic maintenance	• Grease gun • Hand tools • Hammers • Pry bar • Step ladder • Tape measure
2. Demonstrate knowledge of inspecting engines on mobile cranes	• Oil levels • Air filters • Radiator levels and coolant systems • Air dryer systems
3. Demonstrate knowledge of inspecting monitoring devices on mobile cranes	• Load monitoring and indicating systems (when equipped) • Boom angle indicator (when equipped) • Boom length indicator (when equipped) • Anti-two block device (when equipped) • Load radius indicator • Level indicator • Drum rotation indicator

4. Demonstrate knowledge of inspecting hydraulic systems on mobile cranes	• Safety precautions
	  ○ Discharge of pressure in system
	  ○ Oil being injected into the bloodstream
	  ○ Shutdown of motor
	  ○ Burns and scalds
	• Hydraulic systems
	  ○ Pumps
	  ○ Fluid levels
	  ○ Hoses
	  ○ Motors
	  ○ Valves

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I3 Demonstrate knowledge of servicing and maintenance procedures

Objectives

To be competent in this area, the individual must be able to:

- Describe basic service and maintaince procedures.
- Describe recording and reporting procedures.

LEARNING TASKS	CONTENT
1. Demonstrate knowledge of engine cooling system maintenance information from manufacturer's manuals	• Use and interpretation

2. Demonstrate knowledge of service and maintenance performed on mobile cranes	• Basic service and maintenance of crane engines
	  ○ Greasing fittings
	  ○ Addition of required fluids
	  ○ Adjustment of belts
	  ○ Replacement of belts
	  ○ Replacement of air cleaners
	  ○ Oil and filter change
	  ○ Hoses
	• Adjustment of control mechanisms
	  ○ Slack adjusters
	  ○ Rollers
	  ○ Cables
	  ○ Brakes
	  ○ Clutches
	  ○ Levers
	• Structural maintenance
	  ○ Bolts
	  ○ Cotter pins and keepers
	  ○ Pins
	  ○ Guard rails, handholds, steps
	  ○ Tracks
	  ○ Idlers
	  ○ Grease
	• Cleaning
	  ○ Batteries

- Cab
- Windows
- Wheels
- Tracks
- Deck
- Car body

- Service and maintenance to crane and accessory systems
  - Gearbox
  - Hydraulic tank breathers
  - Outriggers and stabilizers
  - Booms
  - Steering systems
  - Air tanks
  - Filters
  - Tires (condition and pressure)
- Maintenance of cooling systems
  - Air cooling systems
  - Water cooling systems

3. Demonstrate knowledge of factors influencing operator's maintenance responsibilities

- Operator's responsibility
- Operator's capabilities
- Tool availability
- Company policy
- Location

4. Demonstrate knowledge of reporting and recording procedures for mobile crane service and maintenance

- Procedure for reporting defects to supervisory personnel
  - Part 4.9 of WorkSafeBC Occupational Health and Safety Regulation (OHSR)
- Maintenance records in the logbook
  - Maintenance requested
  - Maintenance performed
  - Legal requirements for entries
  - Part 4.9 of WorkSafeBC Occupational Health and Safety Regulation (OHSR)

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I7 Perform service on engine cooling systems on mobile cranes

Objectives

To be competent in this area, the individual must be able to perform service on engine air cooling systems and water air cooling systems according to manufacturer's specifications.

LEARNING TASKS	CONTENT
1. Perform service on engine cooling systems according to manufacturer's specifications	• Manufacturer's manuals • Engine air cooling systems • Water air cooling systems

Achievement Criteria

Performance	Demonstrate competence performing service on engine cooling systems on mobile cranes.
Conditions	Trainee will be given a project(s), manufacturer's manuals and the tools and materials required to perform service on a mobile crane's engine cooling system.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I15 Complete maintenance checklists (engine on/engine off) and maintain engines on boom trucks (unlimited tonnage) to manufacturer's specifications

Objectives

To be competent in this area, the individual must be able to:

- Identify, record and report problems accurately.
- Perform basic service and maintenance.

LEARNING TASKS	CONTENT
1. Complete maintenance engine checklists while the engine is OFF	• In accordance with the company's requirements and manufacturer's manuals • Problem identification • Documentation of identified problems in the maintenance logbook • Requirements for reporting identified problems to supervisory personnel
2. Complete maintenance engine checklists while the engine is ON	• In accordance with the company's requirements and manufacturer's manuals • Problem identification • Documentation of identified problems in the maintenance logbook • Requirements for reporting identified problems to supervisory personnel

3. Maintain engines to the manufacturer's specifications	• Basic service and maintenance
	  ○ Addition of required fluids
	  ○ Adjustment of belts
	  ○ Replacement of belts
	  ○ Air cleaners
	  ○ Oil filters
	  ○ Hoses
	• Manufacturer's manuals
	• Tools
	  ○ Grease gun
	  ○ Wrenches
	  ○ Screwdrivers
	  ○ Hammers
	  ○ Vice grips
	  ○ Pinch bar
	  ○ Step ladder
	  ○ Tape measure

- Structural maintenance
  - Bolts
  - Wedges
  - Cotter keys
  - Pins
  - Guard rails
- Service and maintenance to boom truck and accessory systems
  - Gearbox
  - Hydraulic tank breathers
  - Outriggers and stabilizers
  - Booms
  - Steering systems
  - Air tanks
  - Filters
- Cleaning
  - Batteries
  - Windows
  - Wheels
  - Deck

Achievement Criteria

Performance	Demonstrate competence completing maintenance checklists (engine on/engine off) and maintaining engines on boom trucks (unlimited tonnage).
Conditions	Trainee will be given a project(s) and the tools and materials required to complete a boom truck (unlimited tonnage) maintenance checklist (engine on/engine off) and perform basic maintenance requirements according to manufacturer's specifications.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I16 Perform routine inspections and maintenance on hydraulic systems on boom trucks (unlimited tonnage)

Objectives

To be competent in this area, the individual must be able to inspect and maintain the various components of a boom truck hydraulic system safely and correctly.

LEARNING TASKS	CONTENT

1. Perform routine inspections and maintenance of hydraulic systems on boom trucks (unlimited tonnage)	• Inspection
	  ○ Pumps
	  ○ Fluid levels
	  ○ Hoses
	  ○ Motors
	• Maintenance

Achievement Criteria

Performance	Demonstrate competence performing routine inspections and maintenance on hydraulic systems on boom trucks (unlimited tonnage).
Conditions	Trainee will be given a project(s) and the tools and materials required to inspect and maintain the various hydraulic system components of a boom truck (unlimited tonnage).
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I17 Inspect monitoring devices and control mechanisms on boom trucks with folding booms (unlimited tonnage)

Objectives

To be competent in this area, the individual must be able to inspect monitoring devices and control mechanisms on boom trucks with folding booms (unlimited tonnage) and perform maintenance safely and correctly.

LEARNING TASKS	CONTENT

1. Inspect monitoring devices on boom trucks with folding booms (unlimited tonnage) according to manufacturer's specifications and company requirements	• Inspection
	  ○ Load monitoring systems
	  ○ Anti-two block device (when equipped with hoist)
	• Maintenance

2. Inspect control mechanisms on boom trucks with folding booms (unlimited tonnage) according to manufacturer's specifications and company requirements	• Inspection
	• Adjustment
	  ○ Cables
	  ○ Brakes
	  ○ Levers

Achievement Criteria

Performance	Demonstrate competence inspecting monitoring devices and control mechanisms on boom trucks with folding booms (unlimited tonnage).
Conditions	Trainee will be given a project(s) and the tools and materials required to inspect monitoring devices and control mechanisms on boom trucks with folding booms (unlimited tonnage) and perform any necessary maintenance or adjustments.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Line (GAC): I MAINTENANCE AND SERVICE

Competency: I27 Inspect monitoring devices and control mechanisms on boom trucks with stiff booms (unlimited tonnage)

Objectives

To be competent in this area, the individual must be able to inspect monitoring devices and control mechanisms on boom trucks with stiff booms (unlimited tonnage) and perform maintenance safely and correctly.

LEARNING TASKS	CONTENT

1. Inspect monitoring devices on boom trucks with stiff booms (unlimited tonnage) according to manufacturer's specifications and company requirements	• Inspection
	  ○ Load monitoring and indicating systems
	  ○ Boom angle indicator
	  ○ Boom length indicator
	  ○ Anti-two block device
	• Maintenance

2. Inspect control mechanisms on boom trucks with stiff booms (unlimited tonnage) according to manufacturer's specifications and company requirements	• Inspection
	• Adjustment
	  ○ Cables
	  ○ Brakes
	  ○ Clutches
	  ○ Levers

Achievement Criteria

Performance	Demonstrate competence inspecting monitoring devices and control mechanisms on boom trucks with stiff booms (unlimited tonnage).
Conditions	Trainee will be given a project(s) and the tools and materials required to inspect monitoring devices and control mechanisms on boom trucks with stiff booms (unlimited tonnage) and perform any necessary maintenance or adjustments.
Criteria	Within specifications, safety standards and time frames acceptable to industry.

Section 4

TRAINING PROVIDER STANDARDS

Training Provider Standards

This Program is a competency-based program of instruction. The Program Outline defines the outcomes expected of training, not the inputs, which include time. By their nature, cranes require a one-to-one ratio of student-to-crane to develop the required competencies. Industry believes a crane operator becomes competent through building on his or her theoretical knowledge with real world experience.

This program is divided into theory and practical standards.

The theory component of the standards may be:

- taught in a classroom setting by a qualified instructor (see below)
- delivered online
- learned through self-study online or through printed materials

The practical component of the standards:

- require hands-on experience
- are assessed on the job by a Registered Workplace Assessor
- may be begun in a simulated setting such as a training yard, but are assessed for credit in the workplace

The industry is interested in the outcome of training and leaves it to the crane training community to deliver training to these standards in a time efficient and cost effective manner. With these competence standards, industry has a vehicle for structuring on-the-job training and wishes to see trainers take advantage of the opportunity that on-the-job training represents, including:

1. Support learners on the job by bringing the trainer to the job site. Crane purchase or rental is not required by the trainer and the learner receives targeted instruction.
2. Deliver instruction in the evenings or on weekends to complement the learner's on-the-job experience.
3. Deliver targeted theory and practical instruction precisely geared to the standards in this outline – which will ideally guarantee a highly skilled individual to the employer who can demonstrate workplace competence in short order.

Facility Requirements

Industry has purposely not set minimum facilities requirements for this trade in the interest of permitting training providers maximum flexibility in the options and strategies they may employ in training to these standards. The industry is interested in the outcome of training and leaves it to the crane training community to deliver training to these standards in a time efficient and cost effective manner.

Classroom Area

- N/A

Shop Area

- N/A

Lab Requirements

- N/A

Student Facilities

- N/A

Instructor Office Space

- N/A

Tools and Equipment

The crane and equipment used for training should be representative of the appropriate crane license classification.

Hand Tools

Recommended

- Adjustable wrenches (various sizes)
- Calculator
- Flashlight
- Grease gun
- Hammers (ball peen, sledge, various sizes)
- Level
- Line-up bar, drift pin
- Measuring tape
- Oilcan
- Pliers (needle nose, slip joint)
- Ratchet and socket set
- Screwdrivers (flat, Phillips, Robertson, various sizes)
- Shovel
- Squeegee
- Tag lines
- Tire pressure gauge
- Vice grips
- Wear gauge (wire rope and sheave)
- Wire brush
- Wire rope cutter
- Wrench sets (open and closed ends, metric and imperial)

Power Tools and Equipment

Recommended

- Handheld and stationary radios
- Steam cleaner or power washer

Personal Protective Equipment (PPE) and Safety Equipment

Recommended

- Coveralls
- Ear plugs and muffs
- Eye wash station
- Face shields
- Safety glasses
- Goggles
- Fire extinguishers
- First aid kit
- Gloves
- Hard hat
- Masks (particle, vapour)
- Safety boots
- Spill kit
- High visibility vest

Reference Materials

Recommended Resources

- Mobile Crane Manual, by Donald E. Dickie, P. Eng., D. H. Campbell, P. Eng.
  Publisher: Infastructure Health & Safety Association, http://www.ihsa.ca/
- Rigging Manual, by Donald E. Dickie, P. Eng.
  Publisher: Infastructure Health & Safety Association, http://www.ihsa.ca/
- Hoisting and Rigging Safety Manual
  Publisher: Infastructure Health & Safety Association, http://www.ihsa.ca/
- Mobile Craning Today
  Publisher: Operating Engineers Training Institute of Ontario, http://www.oetio.com
- IPT's Crane and Rigging Handbook, by Ronald G. Garby
  Publisher: IPT Publishing and Training Ltd. http://www.iptbooks.com
- IPT's Crane and Rigging Training Manual, by Ronald G. Garby
  Publisher: IPT Publishing and Training Ltd. http://www.iptbooks.com
- WorkSafeBC Occupational Health and Safety Regulation (OHSR)
- CAN/CSA Z150 Safety Code for Mobile Cranes
- ANSI Standard ANSI/ASME B30.5, Mobile and Locomotive Crane or ANSI/ASME B30.22 Articulating Boom Crane

NOTE:

This list of Reference Materials is for training providers. Apprentices should contact their preferred training provider for a list of recommended or required texts for this program.

Instructor Requirements

Occupation Qualification

The instructor must possess:

- Unrestricted Proof of Competence from the BC Association for Crane Safety and/or Interprovincial Red Seal Certificate appropriate to the crane classification for which they provide training.

Work Experience

Instructors must have a minimum of five years experience working as a journeyperson operator for the appropriate crane type(s).