

SKILLED**TRADES**^{BC}

PROGRAM OUTLINE

Ironworker (Generalist)

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IRONWORKER (GENERALIST) PROGRAM OUTLINE

**APPROVED BY INDUSTRY
DECEMBER 2012**

**BASED ON
NOA 2010**

**Developed by
SkilledTradesBC
Province of British Columbia**

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Section 1
INTRODUCTION
Ironworker (Generalist)

Foreword

The revised Ironworker (Generalist) Program Outline is intended as a guide for instructors, apprentices, employers of apprentices, as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the new Ironworker (Generalist) National Occupational Analysis (2010) and British Columbia industry and instructor subject matter experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

The Program Outline was prepared with the advice and assistance of the Ironworker Governance Committee. It will form the basis for further updating of the British Columbia Ironworker (Generalist) Program by the British Columbia Construction Industry Training Organization (CITO) on behalf of SkilledTradesBC.

Each competency is to be evaluated through the use of written examination in which the learner must achieve a minimum of 70% in order to receive a passing grade. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

Practical exercises are included for those competencies that require a practical component. These exercises indicate the type of measurable and observable practical performance to be demonstrated by the learner as proof of attainment of the skills. The criteria for evaluating the practical exercises should be objective and consistent in reflecting the standards of the industry. These exercises are intended to ensure consistency in the learning experience of trainees at all institutions. Safety is an inherent part of all theory and practical assignments.

Qualifications in WHMIS, First Aid, Confined Space, Fall Protection and Aerial Boom Lift are all suggested and are required for some practical components of the program.

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

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- Jason Block
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- Alphonse Lavalley
- Andrew Reid
- Ron Rollins

Industry Subject Matter Experts retained as outline reviewers:

- Derek Dinzey
- Mike McKoryk
- Wayne McMillan
- Alphonse Lavalley

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Ironworker (Generalist) 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
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, measurable 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
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

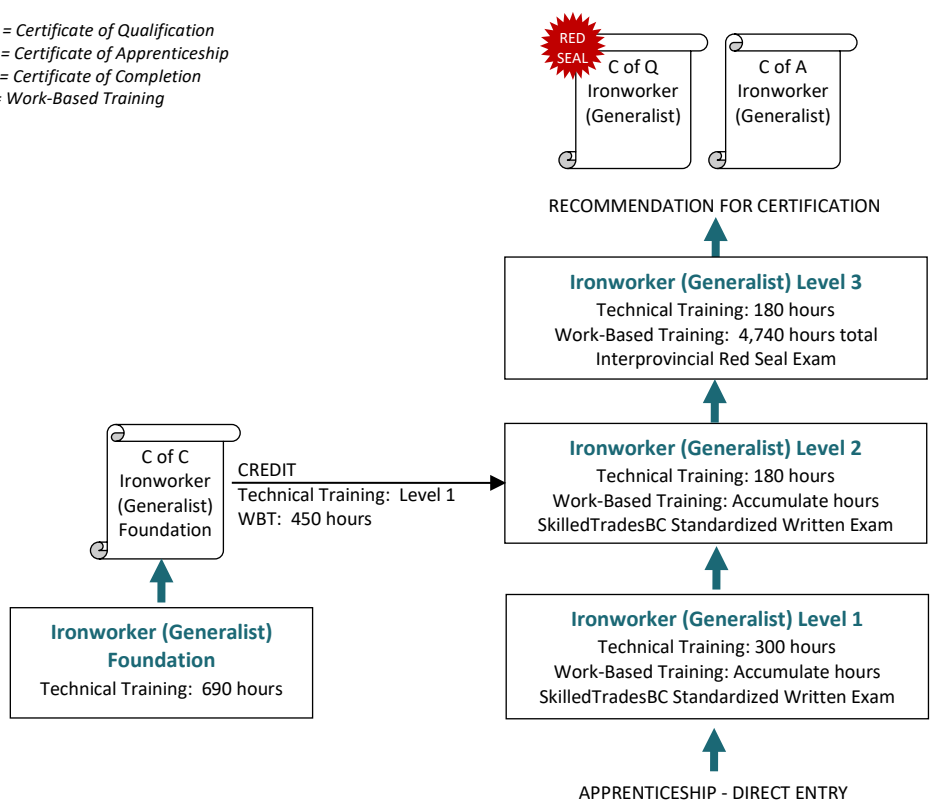
Ironworker (Generalist)

Program Credentialing Model

Apprenticeship Pathway

This graphic provides an overview of the Ironworker (Generalist) apprenticeship pathway.

*C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship
C of C = Certificate of Completion
WBT = Work-Based Training*



CROSS-PROGRAM CREDITS

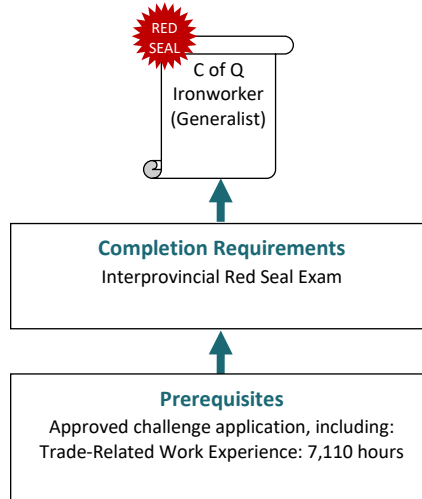
Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

Challenge Pathway

This graphic provides an overview of the Ironworker (Generalist) 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

IRONWORKER (GENERALIST)

Occupation Description: “Ironworker (Generalist)” means a person who rigs, welds, burns, rivets, bolts, drills, fits and fabricates or otherwise handles structural shapes and plates in the erection, demolition, repair and routine maintenance of steel structures, such as buildings, towers, cranes, and bridges, and is involved with placing or moving machinery, curtain wall, window wall, tilt-up, column cladding, architectural metal, the detailing, placing, post-tensioning, pre-stressing and tying of reinforcing steel or cable including the unloading and handling of all such material in the field for work as is usually performed by a journeyman Ironworker.

Use Safe Work Practices A	Control Workplace Hazards A1 1	Interpret OHS Regulations and WCB Standards A2 1	Attain Confined Space Awareness Training A3 1	Use Fall Protection Systems A4 1	Use Personal Protective Equipment A5 1	Use Fire Safety Procedures A6 1	
	Attain First Aid Certification A7 1	Attain WHMIS Certification A8 1					
	Use Tools and Equipment B	Use Hand Tools B1 1	Use Measurement and Layout Tools B2 1 2 3	Use Power Tools B3 1	Use Welding and Cutting Tools B4 1 2 3	Use Ladders and Platforms B5 1	Attain Aerial Work Platform Certification B6 1
		Use Concrete Connecting and Anchoring Tools and Equipment B7 1					
		Organize Work C	Use Mathematics C1 1 2 3	Interpret Drawings and Specifications C2 1 2 3	Communicate with Others C3 1	Handle Materials C4 1	Plan a Project C5 3

Program Overview

Use Rigging, Hoisting and Lifting Equipment
D

Use Ropes and Slings					D1
1	2	3			

Use Rigging and Hoisting Equipment					D2
1	2	3			

Use Mechanical Moving Equipment					D3
1		3			

Apply Crane Work Procedures
E

Assemble and Disassemble Cranes					E1
1	2	3			

Apply Lifting Practices for Cranes					E2
1		3			

Erect Structural Members
F

Apply the Principals of Erecting Structural Components					F1
1					

Install Structural Members					F2
1	2	3			

Install Ornamental Components and Systems					F3
	2	3			

Install Conveyors, Machinery and Equipment					F4
		3			

Apply Reinforcing Techniques
G

Apply Principles of Reinforcing Concrete					G1
1	2	3			

Install and Fabricate Reinforcing Material					G2
1	2				

Apply Pre-Stressing/Post-Tensioning Techniques
H

Describe Principles of Pre-Stressed Systems					H1
1					

Place Unbonded Post-Tensioning Systems					H2
1		3			

Place Bonded Post-Tensioning Systems					H3
	2				

Maintain and Upgrade Structural Steel and Components
I

Make Repairs and Revisions					I1
	2				

Dismantle and Remove Structural, Mechanical and Miscellaneous Components					I2
	2	3			

Training Topics and Suggested Time Allocation

IRONWORKER (GENERALIST) – LEVEL 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	Use Safe Work Practices	10%	90%	10%	100%
A1	Control Workplace Hazards		✓		
A2	Interpret OHS Regulations and WCB Standards		✓		
A3	Attain Confined Space Awareness Training		✓		
A4	Use Fall Protection Systems		✓	✓	
A5	Use Personal Protective Equipment		✓		
A6	Use Fire Safety Procedures		✓		
A7	Attain First Aid Certification		✓		
A8	Attain WHMIS Certification		✓		
Line B	Use Tools and Equipment	16%	30%	70%	100%
B1	Use Hand Tools		✓		
B2	Use Measurement and Layout Tools		✓	✓	
B3	Use Power Tools		✓	✓	
B4	Use Welding and Cutting Tools		✓	✓	
B5	Use Ladders and Platforms		✓		
B6	Attain Aerial Work Platform Certification		✓		
B7	Use Concrete Connecting and Anchoring Tools and Equipment		✓		
Line C	Organize Work	8%	80%	20%	100%
C1	Use Mathematics		✓		
C2	Interpret Drawings and Specifications		✓	✓	
C3	Communicate with Others		✓		
C4	Handle Materials		✓		
Line D	Use Rigging, Hoisting and Lifting Equipment	12%	50%	50%	100%
D1	Use Ropes and Slings		✓	✓	
D2	Use Rigging and Hoisting Equipment		✓	✓	
D3	Use Mechanical Moving Equipment		✓		
Line E	Apply Crane Work Procedures	8%	60%	40%	100%
E1	Assemble and Disassemble Cranes		✓	✓	
E2	Apply Lifting Practices for Cranes		✓	✓	
Line F	Erect Structural Members	20%	30%	70%	100%
F1	Apply the Principals of Erecting Structural Components		✓		
F2	Install Structural Members		✓	✓	
Line G	Apply Reinforcing Techniques	20%	30%	70%	100%
G1	Apply Principles of Reinforcing Concrete		✓		
G2	Install and Fabricate Reinforcing Material		✓	✓	
Line H	Apply Pre-Stressing/Post-Tensioning Techniques	6%	100%	0%	100%

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
H1	Describe Principles of Pre-Stressed Systems		✓		
H2	Place Unbonded Post-Tensioning Systems		✓		
Total Percentage for Ironworker (Generalist) Level 1		100%			

Training Topics and Suggested Time Allocation

IRONWORKER (GENERALIST) – LEVEL 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line B	Use Tools and Equipment	20%	30%	70%	100%
B2	Use Measurement and Layout Tools		✓	✓	
B4	Use Welding and Cutting Tools		✓	✓	
Line C	Organize Work	10%	60%	40%	100%
C1	Use Mathematics		✓		
C2	Interpret Drawings and Specifications		✓	✓	
Line D	Use Rigging, Hoisting and Lifting Equipment	10%	50%	50%	100%
D1	Use Ropes and Slings		✓	✓	
D2	Use Rigging and Hoisting Equipment		✓	✓	
Line E	Apply Crane Work Procedures	6%	100%	0%	100%
E1	Assemble and Disassemble Cranes		✓		
Line F	Erect Structural Members	16%	30%	70%	100%
F2	Install Structural Members		✓		
F3	Install Ornamental Components and Systems		✓	✓	
Line G	Apply Reinforcing Techniques	16%	30%	70%	100%
G1	Apply Principles of Reinforcing Concrete		✓		
G2	Install and Fabricate Reinforcing Material		✓	✓	
Line H	Apply Pre-Stressing/Post-Tensioning Techniques	16%	50%	50%	100%
H3	Place Bonded Post-Tensioning Systems		✓	✓	
Line I	Maintain and Upgrade Structural Steel and Components	6%	100%	0%	100%
I1	Make Repairs and Revisions		✓		
I2	Dismantle and Remove Structural, Mechanical and Miscellaneous Components		✓		
Total Percentage for Ironworker (Generalist) Level 2		100%			

Training Topics and Suggested Time Allocation

IRONWORKER (GENERALIST) – LEVEL 3

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line B	Use Tools and Equipment	18%	20%	80%	100%
B2	Use Measurement and Layout Tools		✓	✓	
B4	Use Welding and Cutting Tools		✓	✓	
Line C	Organize Work	12%	90%	10%	100%
C1	Use Mathematics		✓		
C2	Interpret Drawings and Specifications		✓		
C5	Plan a Project		✓	✓	
Line D	Use Rigging, Hoisting and Lifting Equipment	16%	35%	65%	100%
D1	Use Ropes and Slings		✓		
D2	Use Rigging and Hoisting Equipment		✓	✓	
D3	Use Mechanical Moving Equipment		✓	✓	
Line E	Apply Crane Work Procedures	9%	80%	20%	100%
E1	Assemble and Disassemble Cranes		✓		
E2	Apply Lifting Practices for Cranes		✓	✓	
Line F	Erect Structural Members	12%	35%	65%	100%
F2	Install Structural Members		✓	✓	
F3	Install Ornamental Components and Systems		✓		
F4	Install Conveyors, Machinery and Equipment		✓	✓	
Line G	Apply Reinforcing Techniques	9%	80%	20%	100%
G1	Apply the Principles of Reinforcing Concrete		✓	✓	
Line H	Apply Pre-Stressing/Post-Tensioning Techniques	12%	20%	80%	100%
H2	Place Unbonded Post-Tensioning Systems		✓	✓	
Line I	Maintain and Upgrade Structural Steel and Components	12%	40%	60%	100%
I2	Dismantle and Remove Structural, Mechanical and Miscellaneous Components		✓	✓	
Total Percentage for Ironworker (Generalist) Level 3		100%			

Section 3
PROGRAM CONTENT
Ironworker (Generalist)

Level 1

Ironworker (Generalist)

Line (GAC): A USE SAFE WORK PRACTICES

Competency: A1 Control Workplace Hazards

Objectives

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

- Identify and describe workplace hazards.
- Manage workplace hazards.
- Demonstrate emergency procedures.
- Describe non-emergency injury reporting procedures.
- Describe how worksite safety policies are established.

LEARNING TASKS

1. Describe short term hazards in the Ironworker trade

CONTENT

- Excavation
- Rock anchors
- Pile driving
- Suspended slab (falsework)
- Overhead hazards
- Geothermal drilling
- Slip hazards
- Fall hazards
- Swing hazards
- Pinch points and bites
- Sharp objects
- Ladders
- Work platforms
- Electrical
- Lockout procedures
- Compressed gas
- Explosive material (dust)
- Lifting/ergonomics
- Personal apparel
 - Clothing
 - Hair and beards
 - Jewellery
- Housekeeping
- Clear head-impairment
- Horseplay
- Respect for others safety
 - Workplace conduct
 - Workplace violence
- Constant awareness of surroundings
- Safe attitude
- Management of hazards
- Noise
- Marine operations
- Environmental

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>2. Describe long term hazards in the Ironworker trade</p> <p>3. Describe safety precautions when working at elevations</p> <p>4. Demonstrate emergency procedures</p> <p>5. Describe non-emergency injury reporting procedures</p> | <ul style="list-style-type: none"> ○ Water ○ Wildlife ○ Sunstroke ○ Fatigue ○ Dehydration ● Shot-crete ● Grout ● Respiratory disease ● Asbestos ● Noise ● Repetitive strain injuries ● Management of hazards ● Silica ● Wind ● Floor openings ● Guard rails ● Safety lines ● Weather ● Stressed cables ● Access and egress ● Emergency evacuation <ul style="list-style-type: none"> ○ On site evacuation box ● Emergency shutoffs ● Fire control systems ● Eye wash facilities ● Emergency exits ● Emergency contact/phone numbers ● Outside meeting place ● Disaster meeting place ● First aid facilities ● Reports |
|---|---|

LEARNING TASKS

6. Describe and interpret worksite safety policies

CONTENT

- Process
 - Hazard assessment
 - Conditions
 - Meeting requirements
 - Reporting hazards and incidents (report immediately)
 - Reporting injuries
 - Investigations
 - Committees
 - Employee orientation
 - First-aid
 - Hearing
 - Records and statistics
 - Lock-out
 - Non-compliance procedures
- Minimum standards
- Fall protection plan
- Acts and regulations
- Province specific
- Federal
- Site specific
- OSHA
- Hierarchy of safety policies

Line (GAC): **A USE SAFE WORK PRACTICES**
Competency: **A2 Interpret OHS Regulations and WCB Standards**

Objectives

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

- Locate and interpret the Occupational Health and Safety Regulations applicable to the Ironworker workplace.

LEARNING TASKS	CONTENT
1. Locate terms used in the Workers’ Compensation Act	<ul style="list-style-type: none"> • Definitions, Section 1 of the Act
2. Locate the conditions under which compensation will be paid	<ul style="list-style-type: none"> • Division 2 of the Act
3. Locate the general duties of employers, employees and others	<ul style="list-style-type: none"> • Division 3, Sections 115-124 of the Act
4. Locate the Workers’ Compensation Act requirements for the reporting of accidents	<ul style="list-style-type: none"> • Division 5, Sections 53 and 54 of the Act
5. Locate the “Core Requirements” of the Occupational Health and Safety Regulation	<ul style="list-style-type: none"> • Definitions • Application • Rights and responsibilities <ul style="list-style-type: none"> ○ Health and safety programs ○ Investigations and reports ○ Workplace inspections ○ Right to refuse work • General conditions <ul style="list-style-type: none"> ○ Building and equipment safety ○ Emergency preparedness ○ Preventing violence ○ Working alone ○ Ergonomics ○ Illumination ○ Indoor air quality ○ Smoking and lunchrooms
6. Locate the “General Hazard Requirements” of the Occupational Health and Safety Regulation	<ul style="list-style-type: none"> • Chemical and biological substances • Substance specific requirements • Noise, vibration, radiation and temperature • Personal protective clothing and equipment • Confined spaces • De-energization and lockout • Fall protection • Tools, machinery and equipment • Ladders, scaffolds and temporary work platforms • Cranes and hoists • Rigging

LEARNING TASKS

7. Interpret Occupational Health and Safety information that is relevant to the Ironworker trade

CONTENT

- Mobile equipment
- Transportation of workers
- Traffic control
- Electrical safety
- Post tensioning
- As per documentation

Line (GAC): **A USE SAFE WORK PRACTICES**
Competency: **A3 Attain Confined Space Awareness Training**

Objectives

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

- Attain confined space awareness qualification.
- Recognize a confined space.
- Apply confined space procedures.

LEARNING TASKS

CONTENT

<p>1. Attain confined space awareness qualification</p> <p>2. Describe a confined space</p> <p>3. Identify equipment used when working in a confined space</p> <p>4. Describe the use of equipment and procedures in a confined space scenario</p>	<ul style="list-style-type: none"> • Arrange training with a certified provider of confined space certification • Section 9 of OHS • Responsibilities of worker and employer • Procedures <ul style="list-style-type: none"> ○ Access/egress ○ Hole watch ○ Air quality testing ○ Explosive environments ○ Lock out and isolation ○ Ventilation ○ Cleaning/purging/venting/inerting ○ Rescue procedures • Entry permits • Respirators • Ladders • Tripod • Harnesses • Air tester • Tools as per conditions • As per above content
--	---

Line (GAC): A USE SAFE WORK PRACTICES

Competency: A4 Use Fall Protection Systems

Objectives

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

- Select appropriate fall protection equipment.
- Use fall protection equipment and systems.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Attain fall protection certification</p> | <ul style="list-style-type: none"> • Arrange training with a certified provider of fall protection certification |
| <p>2. Describe fall protection equipment</p> | <ul style="list-style-type: none"> • Fall arrest/restraint/work positioning equipment <ul style="list-style-type: none"> ○ Harnesses ○ Waist belts/D-ring belt with belly hook ○ Hardware <ul style="list-style-type: none"> – Beamer – Lanyard – Carabiner – Shock-absorbing devices – Retractable devices – Vertical line grab (fibre and wire) – Cable/nylon tie-off slings – Work positioning systems ○ Standards (CSA) • Inspection and maintenance • Worksite awareness |
| <p>3. Describe fall protection systems</p> | <ul style="list-style-type: none"> • Railings/scaffolds • Nets • Hardware • Anchor points • Assembly • Ladder systems • Vertical and horizontal systems |
| <p>4. Demonstrate proper use of fall protection equipment and systems</p> | <ul style="list-style-type: none"> • OHS Regulations Part 11 • Daily inspection • Assembly/disassembly • Fall protection plan <ul style="list-style-type: none"> ○ Identify work area and risks ○ List and choose equipment ○ Rescue procedures • Fit test |

Achievement Criteria

Performance	The learner will use fall protection systems in compliance with all safety regulations.
Conditions	The learner will be given: <ul style="list-style-type: none">• Personal fall protection equipment• Vertical/horizontal lifelines systems• Retractable lifelines• Beamers• Other applicable attachments
Criteria	The learner will score 100% on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Inspection and care of equipment• Fit of equipment• Selection and use of system

Line (GAC): A USE SAFE WORK PRACTICES

Competency: A6 Use Fire Safety Procedures

Objectives

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

- Identify various classes of fires.
- Apply preventative fire safety precautions.
- Select appropriate fire extinguishers for the class of fire and environmental condition.
- Use equipment to prevent various classes of fire.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Describe the conditions necessary to support a fire</p> | <ul style="list-style-type: none"> • Air • Fuel • Heat • Flashpoint |
| <p>2. Describe the classes of fires according to the materials being burned</p> | <ul style="list-style-type: none"> • Class A • Class B • Class C • Class D • Symbols and colours |
| <p>3. Apply preventative fire safety precautions when working near, handling or storing flammable liquids or gases, combustible materials and electrical apparatus</p> | <ul style="list-style-type: none"> • Fuels <ul style="list-style-type: none"> ○ Diesel ○ Gasoline ○ Propane ○ Natural gas • Ventilation <ul style="list-style-type: none"> ○ Purging • Lubricants • Oily rags • Combustible metals • Aerosols |
| <p>4. Describe the considerations and steps to be taken prior to fighting a fire</p> | <ul style="list-style-type: none"> • Warning others and fire department • Evacuation of others • Fire contained and not spreading • Personal method of egress • Training |
| <p>5. Apply the procedure for using a fire extinguisher</p> | <ul style="list-style-type: none"> • Extinguisher selection • P.A.S.S. <ul style="list-style-type: none"> ○ Pull ○ Aim ○ Squeeze ○ Sweep |

LEARNING TASKS

6. Identify the hazards and procedures associated with hot work

CONTENT

- Hot work permits
- Fire watch/spark watch
- Site specific requirements

Line (GAC): **A USE SAFE WORK PRACTICES**
Competency: **A7 Attain First Aid Certification**

Objectives

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

- Attain First Aid certification.

LEARNING TASKS

1. Attain First Aid certification

CONTENT

- Arrange training with a certified provider of First Aid certification

Line (GAC): A USE SAFE WORK PRACTICES

Competency: A8 Attain WHMIS Certification

Objectives

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

- Attain WHMIS certification.
- Follow WHMIS requirements.

LEARNING TASKS

1. Attain WHMIS certification

2. Describe WHMIS legislation

3. Describe the key elements of WHMIS

4. Describe information disclosed on a MSDS

CONTENT

- Arrange training with a certified provider of WHMIS certification

- Purpose of legislation
- Federal
- Provincial
- Responsibilities
 - Employers
 - Provide worker access to Material safety data sheets (MSDSs)
 - Worker training
 - Ensure proper storage and handling of materials
 - Suppliers
 - Provide MSDSs
 - Labelling of containers
 - Workers
 - Understand information of MSDSs and labels
 - Follow WHMIS requirements

- MSDSs
- Labelling of containers of hazardous materials
- Worker education programs

- Hazardous ingredients
- Preparation information
- Product information
- Physical data
- Fire or explosion
- Reactivity data
- Toxicological properties
- Preventive measures
- First-aid measures

LEARNING TASKS

5. Identify symbols found on WHMIS labels and their meaning

6. Apply WHMIS regulations used in ironworking

CONTENT

- Compressed gases
- Flammable and combustible materials
- Oxidizing materials
- Poisonous and infectious materials
 - Materials causing immediate and serious toxic effects
 - Materials causing other toxic effects
 - Biohazardous infectious materials
- Corrosive materials
- Dangerously reactive materials

- Use, storage and disposal of hazardous materials

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B1 Use Hand Tools

Objectives

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

- Select hand tools appropriate to the task.
- Use reinforcing hand tools.
- Use structural hand tools.
- Inspect and maintain tools.

LEARNING TASKS

1. Describe and select general Ironworker hand tools

CONTENT

- Tape measure/marketing device
- Striker
- Pry bar
- Pliers
- Hammers
- Bolt bag
- Torque wrench
- Sockets
- Knife
- Pipe wrench
- Epoxy gun
- Caulking gun
- Wedges and dogs
- Adjustable wrench
- Tiger torch
- Saw wrench
- Slug wrench
- Backer-outer
- Hack saw
- Bolt cutter

2. Describe and select structural hand tools

- Tool belt
 - Adjustable wrench
 - Sleever bar
 - Bull pin
 - Spud wrench/frogs
- Alignment and leverage tools
 - Drift pin/barrel pin
- Dywidag
- Clamping tools
 - C clamps
 - Vice grips
 - Alligator clamps
 - Bessey clamps
- Die nut/chaser nut

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>3. Describe and select reinforcing tools</p> | <ul style="list-style-type: none"> • Tool belt <ul style="list-style-type: none"> ○ Holster ○ Snips/side cutters ○ Pliers ○ Tie wire reel • Task-specific tools <ul style="list-style-type: none"> ○ Tirfors/come-alongs • Hickey bar • Snipe • Pry bars • Spinners • Staple gun (pneumatic and manual) |
| <p>4. Describe and select post-tensioning tools</p> | <ul style="list-style-type: none"> • Screw driver • Wedge-setting tools • Sheath cutter • Pocket former remover • Allen wenchers |
| <p>5. Use hand tools</p> | <ul style="list-style-type: none"> • Purpose/uses • Procedures/operations • Safety • Adjustment • Inspection • Maintenance • Storage • Job requirements • Manufacturer's specifications |

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B2 Use Measurement and Layout Tools

Objectives

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

- Describe and select measurement and layout tools.
- Use and maintain measurement and layout tools.

LEARNING TASKS

1. Describe and select measurement and layout tools

2. Use measurement and layout tools

3. Inspect and maintain measurement and layout tools

CONTENT

- Tape measure
- Squares
 - Tri square
 - Two foot square
 - Bevel square
 - Beam square/beam board
- Levels
 - Laser
 - Builder’s level/auto level
 - Smart levels
- Electronic distance meter
- Straight edge
- Centre punch
- Plumb bob
- String/piano wire
- Marking devices
 - Chalk line
 - Scribe
 - Soap stone
 - Spray paint
 - Paint pen
 - Construction pencil
- Purpose/uses
- Proper use
- Procedures/operations
- Set-up
- Safe use and storage
- Adjustment
- Verifying accuracy
- Manufacturer’s specifications
- Inspection
- Maintenance

Achievement Criteria #1

Performance	The learner will use a builder's level to verify consistent elevation at several locations.
Conditions	The learner will be given: <ul style="list-style-type: none">• Builder's level• Task instructions• Rod holder
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Adherence to task instructions• Proper set up• Accuracy of findings• Care and handling of a builder's level

Achievement Criteria #2

Performance	The learner will set up a laser level.
Conditions	The learner will be given: <ul style="list-style-type: none">• Laser level• Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Accuracy (within clearance tolerance)• Position

LEARNING TASKS

CONTENT

3. Use power tools

- Tie gun
- Staple gun
- Stressing jacks/pump
- Grout machine

- Types
- Parts
- Purpose/uses
- Procedures/order of operations
- Safe use
- Adjustment
- Inspection
- Maintenance
- Storage
- Assured grounding
- Manufacturer's specifications

Achievement Criteria

- | | |
|-------------|---|
| Performance | The learner will construct a project from a given structural steel shop drawing. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • Shop drawing • Materials • Tools and equipment |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Safety • Project built according to shop drawing • Component dimensions • Overall dimensions • Hole locations • Squareness and quality of cut • Top of steel |

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B4 Use Welding and Cutting Tools

Objectives

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

- Describe different methods of cutting.
- Describe safety considerations for cutting and welding.
- Describe how to operate and maintain cutting tools.
- Describe SMAW welding.
- Describe how to operate and maintain welding tools.
- Perform weld using SMAW techniques.

LEARNING TASKS

1. Describe different methods of cutting

CONTENT

- Oxy fuel torch
 - Purpose/uses
 - Limitations
 - Fuel types
- Equipment
 - Torch head
 - Rose bud
 - Combination torch
 - Standard hand torch
 - Lance
 - Striker
 - Tip cleaner
 - Cylinders
 - Cylinder storage and transportation
 - Regulators
 - Reverse flow check valve/flashback arresters
 - Hoses
 - Fittings
 - Repair kit
- Materials to be cut
- Plasma
 - Purpose/uses
 - Limitations
 - Equipment
- Carbon arc
 - Purpose/uses
 - Limitations
 - Equipment
 - Materials to be cut
 - Consumables

2. Cut using various tools

- Safety
- Consumables

LEARNING TASKS

CONTENT

3. Describe shielded metal arc welding (SMAW)

- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Materials to be cut (ferrous and non-ferrous)
- Manufacturer's specifications

4. Use welding tools

- CWB regulations/procedures
- Purpose/uses
- Equipment
- Defects
- Undercut
- Convexity
- Concavity
- Porosity
- Slag inclusions
- Safety
- SMAW
- Consumables
- Materials to be welded
- Stud welding
- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Manufacturer's specifications

Achievement Criteria #1

Performance	The learner will perform a single and multi-pass fillet weld using 7018 (4918) electrode.
Conditions	The learner will be given: <ul style="list-style-type: none">• Tools• Equipment
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Bead size and straightness/penetration• Marriage of beads• Free of weld discontinuities• Safety procedures• PPE

Achievement Criteria #2

Performance	The learner will perform set up and break down of oxy fuel equipment, cut 3/8 in. (10 mm) or larger steel plate to prescribed size, pierce a hole to dimensions.
Conditions	The learner will be given: <ul style="list-style-type: none">• Tools• Equipment• Materials• Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Accurately follow order of operations for set up and break down• Cut material to measured dimensions• Pierce hole to measured size.• Quality of the cut• Safety procedures• PPE

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B5 Use Ladders and Platforms

Objectives

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

- Describe ladders and elevated platforms.
- Select and use ladders and platforms.
- Select and use access equipment.

LEARNING TASKS

1. Describe ladders and elevated platforms

2. Use ladders and elevated platforms

3. Use access equipment

CONTENT

- Scaffolds
 - Rolling
 - Stationary
 - Aluminum boards
 - Scaffold planks
 - Tube and clamp
 - End frame
- Aerial work platforms
 - Scissor lifts
 - Boom lift
 - Man basket (crane supported)
- Ladders
 - Extension ladders
 - Step ladders
- Swing stages and spiders
- Angel wings
- Bridge brackets
- Floats
- Uses
- Safety
 - Hazard recognition
 - OHS
- Selection
- Set up
- Moving ladders
- Limitations
- Securing
- Inspection
- Maintenance
- Storage
- Aerial lifts (certification required; employer responsibility)
 - Boom and scissor
 - Gas powered and electrical

Line (GAC): **B** **USE TOOLS AND EQUIPMENT**
Competency: **B6** **Attain Aerial Work Platform Certification**

Objectives

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

- Attain aerial work platform certification.

LEARNING TASKS

1. Attain aerial work platform certification

CONTENT

- Arrange training with a certified provider of Aerial Work Platform Certification

Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B7 Use Concrete Connecting and Anchoring Tools and Equipment**

Objectives

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

- Describe connecting and anchoring tools/equipment and their uses in concrete.
- Use a hammer drill to drill vertically or horizontally into concrete.

LEARNING TASKS

1. Describe connecting and anchoring tools/equipment and their uses in concrete

CONTENT

- Types
 - Structural connectors and fasteners
 - Architectural connectors and fasteners
- Purpose and procedures for use
- Preparation for use
- Safety considerations
 - PPE
 - Ear protection
 - Eye protection
 - Mouth and nose
- Limitations
- Inspection
- Maintenance
- Storage
- Selection for job requirements
- Equipment used with connectors and fasteners
- Application
- Area
- Selection of anchor
- Selection of drill and bit
- Self-driller
- Pre-drilled
 - Epoxy
 - Wedge
- Grout

2. Describe concrete anchors

LEARNING TASKS

3. Describe procedures for drilling concrete

4. Use a hammer drill to drill vertically or horizontally into concrete

CONTENT

- Preparation
 - Cleaning
 - Wire brushing
 - Layout hole centres
- Drills
 - Pneumatic
 - Hand star
 - Percussion
 - Core
 - Drill and carbide bit
- Drilling in concrete and block walls
 - Rebar contact
 - Spalling
 - Concrete edge distance
 - Depth of hole
 - Starting the hole
- Cleaning
 - Wire brushing/pump
- Safety
- Tool orientation
- Rebar contact

Line (GAC): C ORGANIZE WORK

Competency: C1 Use Mathematics

Objectives

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

- Apply mathematical principals to solve problems.

LEARNING TASKS

1. Use fractions to solve problems
2. Use decimal fractions to solve problems
3. Solve problems of ratio and proportion
4. Use metric and imperial measurements
5. Solve geometric problems
6. Solve problems of triangles

CONTENT

- Add, subtract, multiply and divide
- Express in higher terms
- Simplify fractions
- Add, subtract, multiply and divide
- Convert between decimals and fractions
- Decimal notation
- Ratio
 - Equivalent
- Proportion
- Unknown quantities
- Similar triangles
- Convert between metric and imperial
 - Feet, inches/metres, millimetres
 - Pounds, tons/kilograms, tonnes
- Use conversion tables
- Area
- Perimeter
- Volume
- Angles
- Radius and diameter
- Formulas for area of:
 - Square and rectangles
 - Triangles
 - Parallelogram
 - Trapezoid
 - Circle
- Pythagorean theorem
- Sine
- Cosine
- Tangent

LEARNING TASKS

3. Identify views on drawings

CONTENT

- Relevant codes and standards
- Orthographic projections
- Pictorial
- Isometric
- Oblique
- Plan
- Elevation
- Sections

Achievement Criteria

Performance	The individual will locate information from a shop drawing and create a material list.
Conditions	The individual will be given: <ul style="list-style-type: none"> • Blueprints • Instruction sheet • Blank material list
Criteria	The individual will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy of findings

Line (GAC): **C** **ORGANIZE WORK**
Competency: **C3** **Communicate with Others**

Objectives

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

- Describe methods of communication.
- Communicate with others.

LEARNING TASKS

1. Describe methods of communication

2. Communicate with others

CONTENT

- Listening
- Verbal
- Written
- Drawings
- Two-way radios
- Computers
- Fax machines
- Cell phones
- Hand signals
- Signage
 - People working above
 - Tapes (yellow, red)
- Other trades
- Industry people
- Apprentices (mentoring)
- Interpersonal skills
- Ethics/moral responsibility/respect
- Trade terminology

Line (GAC): C ORGANIZE WORK

Competency: C4 Handle Materials

Objectives

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

- Describe considerations when handling, ordering and coordinating materials.
- Handle materials according to job requirements.

LEARNING TASKS

CONTENT

1. Describe considerations and responsibilities when handling, ordering, coordinating and disposing materials

- Safety/OHS
- Ergonomics
- Storage
- Timing
- Method of transportation
- Off-loading
- LEED (Leadership in Energy and Environmental Design)
- Labelling and MSDS
- Moving
- Product protection
- Recycling
- Identification of materials
- Environmental
- Bill of lading/shipping list
- Disposal

2. Handle materials according to job requirements

- Safety
- Securing
- Packaging/shipping
- Pallets
- Barrels
- Cages
- Containers
- Storage

Achievement Criteria #1

- Performance The learner will perform a prescribed set of knots in a working manner.
- Conditions The learner will be given:
- Equipment
 - Instructions
- Criteria The learner will score 70% or better on a rating sheet that reflects the following criteria:
- Speed
 - Accuracy
 - Tail length and finish

Achievement Criteria #2

- Performance The learner will construct a Flemish and a fold-back eye to specified size.
- Conditions The learner will be given:
- Wire rope
 - Wire rope clips
 - Torque wrench
 - Instructions
- Criteria The learner will score 70% or better on a rating sheet that reflects the following criteria:
- Accuracy
 - Measured eye size
 - Marriage
 - Tail length
 - Proper installation of clip(s)

Line (GAC): D USE RIGGING, HOISTING AND LIFTING EQUIPMENT

Competency: D2 Use Rigging and Hoisting Equipment

Objectives

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

- Describe hoisting and rigging equipment.
- Describe rigging hardware components appropriate for the task.
- Identify auxiliary hoisting equipment.
- Select and use hoisting and rigging equipment.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe hoisting and rigging equipment</p> | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Hoisting equipment ○ Rigging equipment ○ Rolling equipment • Uses • Limitations and capacities • Government regulations • Safety |
| <p>2. Describe rigging hardware components appropriate for the task</p> | <ul style="list-style-type: none"> • Hooks <ul style="list-style-type: none"> ○ Sorting hooks ○ Eye hooks • Headache balls • Swivels • Wedge sockets/beckett • Blocks • Sheaves • Shackles • Clips • Thimbles • Eyebolts • Plate clamps • Beam clamps • Tongs • Load binders • Spreader bars • Equalizer bars and plates • Turnbuckles • Drums • Chains • Softeners • Sway braces • Muffler clamps • Spines/stiffener • Welded lifting collars • Lifting lugs |

LEARNING TASKS

- 3. Identify auxiliary hoisting equipment

- 4. Use hoisting and rigging equipment

CONTENT

- Material/personnel hoisting lifts
- Fork lifts
- Types and applications of hoists and tuggers
- Tugger winches
- Hand winches
- Powered chain hoists
- Chain falls
- Come-a-longs
- Cable pulleys/tirfor

- Calculations
 - Weight
 - Sling/choker tension
 - Hold back
 - Mechanical advantage
 - Friction
 - Lead line pull
 - Centre of gravity
- Selection of equipment
- Selection of lifting location or point
- Anchorage
- Safety
- Operating procedures
- Communication and hand signals
- Securing of loads
- Inspection
- Maintenance
- Storage
- Manufacturer's specifications

Achievement Criteria

- | | |
|-------------|---|
| Performance | The learner will calculate weight, choose the appropriate size rigging and hardware and position the rigging on the load. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • Equipment • Instructions |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy in weight calculation • Use of appropriate sling type and configuration • Selection of appropriate hardware • Control of load • Appropriate crane positioning |

Line (GAC): D USE RIGGING, HOISTING AND LIFTING EQUIPMENT

Competency: D3 Use Mechanical Moving Equipment

Objectives

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

- Describe types of mechanical moving equipment.
- Describe uses for mechanical moving equipment.
- Use mechanical moving equipment.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe types of mechanical moving equipment</p> | <ul style="list-style-type: none"> • Jacks <ul style="list-style-type: none"> ○ Plain screw ○ Differential screw ○ Hydraulic ○ Multi-jack systems ○ Pneumatic ○ Screw gear and ratchet ○ Ratchet-track ○ Wedge and screw ○ Screw and toggle ○ Multi-strand ○ Mono-strand ○ Centre-hole • Rollers <ul style="list-style-type: none"> ○ Pipe ○ Skates ○ Dollies ○ Hillman |
| <p>2. Describe uses for mechanical moving equipment</p> | <ul style="list-style-type: none"> • Lifting/pulling • Post tensioning • Positioning • Blocking and cribbing • Providing clearance • Compressing or spreading • Pin/object removal |

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>3. Describe considerations when using mechanical moving equipment</p> | <ul style="list-style-type: none"> • Procedures • Location/positioning of jacks/rollers • Holdback considerations • Base conditions <ul style="list-style-type: none"> ○ Decline/incline ○ Friction • Size, type and number of jacks/rollers depending on load • Weight distribution • Rigging • Blocking/cribbing • Centre of gravity • Safety • Communication • Handling |
| <p>4. Use mechanical moving equipment</p> | <ul style="list-style-type: none"> • According to job requirements • Knowledge of mass and distribution of weight (centre of gravity) • Length of travel • Safety <ul style="list-style-type: none"> ○ Load limits ○ Ergonomics ○ Position of jack and personnel ○ Ground stability ○ Travel distance/stroke ○ Accuracy ○ Required number ○ Position ○ Controls ○ Gauges ○ Check valves • Storage and handling • Maintenance |

Line (GAC): E APPLY CRANE WORK PROCEDURES

Competency: E1 Assemble and Disassemble Cranes

Objectives

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

- Identify types of cranes.
- Identify hazards associated with cranes.
- Describe crane components.
- Describe crane assembly and breakdown location.
- Describe how to move cranes on site.
- Set up a mobile crane.

LEARNING TASKS

1. Identify types of cranes

2. Identify hazards

CONTENT

- Mobile
 - Wheel/tire mounted
 - Crawler/track mounted
 - Rail mounted
 - Barge
- Tower
 - Fixed jib
 - Luffing jib
- Gantry
- Electronic overhead travelling (EOT)
- Straddle carrier
- Derrick
- Lifting truss/girder
- Gin pole
- Helicopter
- Self-erecting/self-launching
- Highline
- Environmental/site hazards
 - Power lines
 - Underground services
 - Obstructions to swing radius
 - Other equipment in the area
 - Ground/base conditions
 - Extreme elements
 - Tides/wakes
- Crush hazards
- Suspended loads
- Swing hazard

LEARNING TASKS

3. Describe types of crane parts

CONTENT

- Pads/floats
 - Levelling jacks
 - Outriggers
 - Frame
 - Turntable
 - Counterweight
 - House/cab
 - Drums and gantries
 - Boom stops
 - Boom types and sections
 - Lattice
 - Hydraulic
 - Articulating
 - Jibs-straight and luffing
 - Main line
 - Whip line
 - Load block/headache ball
 - Wedge socket/beckett
 - Anti-two-block
 - Mast holdbacks and guylines
 - Trolley
 - Pendant lines
 - Pins/keepers
 - Sheave
 - Jacking sections
 - Tracks
 - Extendable axles
4. Set up mobile crane
- Selection of appropriate crane configuration
 - Assessment of ground conditions
 - Pad types and selection
 - Required tools and equipment
 - Manufacturer's specifications
5. Describe moving cranes on site
- Pre-planning crane location and route
 - Hazards
 - Increase in size and weight
 - Overhead
 - Soil conditions
 - Procedures
 - Communication
 - Manufacturer's specifications

Achievement Criteria

Performance The learner will set up a mobile crane.

Conditions The learner will be given access to:

- Crane and operator
- Crane chart
- Tools and accessories

Criteria The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Checklist
- Crane is level, with wheels off the ground
- Outriggers properly set
- Proper sequence

Line (GAC): E **APPLY CRANE WORK PROCEDURES**
Competency: E2 **Apply Lifting Practices for Cranes**

Objectives

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

- Use communication procedures for moving and hoisting.
- Use safe lifting procedures.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Use communication procedures for moving and hoisting
 2. Use safe lifting procedures | <ul style="list-style-type: none"> • Lift plan • Methods and precautions • Hand signals • Voice communication • Relayed signals
 • Identification of load weight • Appropriate rigging configuration • Identification of radius • Identification of boom angle • Identification of head room • Pick and placement location • Load control • Use of tag lines • Communication |
|---|---|

Achievement Criteria

- | | |
|-------------|--|
| Performance | The learner will demonstrate control of a suspended load with a crane using appropriate communication. |
| Conditions | The learner will be given access to: <ul style="list-style-type: none"> • Task instructions • Materials • A crane and operator • Rigging equipment |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Load control • Quality of signals • Rigging configuration |

Line (GAC): F **ERECT STRUCTURAL MEMBERS**
Competency: F1 **Apply the Principals of Erecting Structural Components**

Objectives

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

- Describe the principles of skeletal construction.
- Describe common building materials.
- Describe general forces/stresses on structural components.
- Describe methods of controlling forces on structures.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Describe principles of skeletal construction</p> | <ul style="list-style-type: none"> • Physical properties • Advantages and disadvantages • Material standards • Construction methods |
| <p>2. Describe common building materials</p> | <ul style="list-style-type: none"> • Structural steel <ul style="list-style-type: none"> ○ Mild ○ Weathering ○ Stainless • Precast concrete • Glue lam/timber • Aluminum • Bronze • Teflon/plastics • Composites • Glass fibre reinforced polymer (GFRP) • Coatings <ul style="list-style-type: none"> ○ Galvanized ○ Epoxy ○ Primer ○ Cadmium ○ Fireproofing • Material hazards |
| <p>3. Describe general forces/stresses on structural components</p> | <ul style="list-style-type: none"> • Static and dynamic forces • Compression • Tension • Shear • Torsion • Uplift • Cantilever • Resonance • Vibration |

LEARNING TASKS

4. Describe methods of controlling forces on structures

CONTENT

- Bracing
- False work
- Bridging
- Shear wall
- Diaphragms
- Stiffeners
- Drag struts
- Gussets
- Dampeners/isolators

Line (GAC): F ERECT STRUCTURAL MEMBERS

Competency: F2 Install Structural Members

Objectives

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

- Describe the purpose and function of structural members and fasteners.
- Attach structural members.
- Level, plumb and align structural members.
- Install structural members.
- Finalize the installation of structural members.

LEARNING TASKS

1. Describe structural members

CONTENT

- Shapes
 - Channel
 - Wide flange
 - Welded wide flange
 - Box beam
 - Standard beam
 - Angle
 - Hollow structural shape (HSS)
 - Bar
 - Plate
 - Pipe
 - Structural Z
 - Structural T
- Functions
 - Columns
 - Girders
 - Beams
 - Joists
 - Trusses
 - Girts
 - Purlins
 - Sag rods
 - Bracing
 - Bridging
 - Q-decking
 - Cladding
 - Hand rail
 - Stairs
 - Canopies

2. Describe fastening of structural members

- Types of connections
 - Bearing
 - Shear

LEARNING TASKS

CONTENT

3. Erect structural members

- Friction
- Direct tension (hanger)
- Moment
- Fastening methods
 - Bolts
 - Pins
 - Welded
 - Combination
 - Epoxy/wedge anchors
 - Dywidag/PT strand
 - Rivets
 - Powder actuated
 - Screws
 - Button punch/crimper
 - Shear/nelson stud
- Organization of material and tools
- Erection plan
- Site specific fall protection plan
- Unloading
- Shake out
 - Mark centres
 - Piece identification
- Sequence of erection
 - Survey elevations and grid lines
 - Shim
 - Column
 - Guy lines (as required)
 - Framing beams
 - Intermediate beams or joist
 - Bracing
 - Purlins and girts
 - Miscellaneous/supports
 - Decking
- Securing members during erection
 - Amount of fasteners to secure load
 - Shared/double connections
 - Fastener location
 - Best practices
- Fit and modification of members
- Fastener selection and installation

4. Level, plumb and align structural members

- Plumbing and alignment equipment
- Plumbing and aligning techniques and tolerances
- Temporary alignment/bracing techniques

LEARNING TASKS

5. Finalize installation of structural members

CONTENT

- Surveying equipment
- Welding
- Revisions/modification
- Torque sequence
- Equipment
- Procedures
 - Tolerance specifications
 - Welding specifications
 - Torque methods
 - Inspection

Achievement Criteria

Performance The learner will erect structural steel.

Conditions The learner will be given:

- Material
- Equipment
- Instructions

Criteria The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Adherence to safety
- Good rigging practices
- Crane work procedures/signalling
- Teamwork/ability to work with others
- Leadership
- Ability to work at elevations
- Interpretation of site plan and erection drawings
- Housekeeping
- Attendance

Line (GAC): G APPLY REINFORCING TECHNIQUES

Competency: G1 Apply Principles of Reinforcing Concrete

Objectives

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

- Describe the principles of concrete.
- Describe where the forces on concrete are manifested in structures.
- Describe the properties of reinforcing systems.
- Describe the principles of reinforced concrete.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Describe the principles of concrete</p> | <ul style="list-style-type: none"> • Properties • Advantages and disadvantages of concrete structures • Hardening, cure time, mPa value |
| <p>2. Describe the forces on concrete</p> | <ul style="list-style-type: none"> • General forces on concrete - live and dead loads (dynamic loads and static loads) • Specific forces on concrete <ul style="list-style-type: none"> ○ Compression ○ Tension ○ Shear |
| <p>3. Describe where the forces on concrete are manifested in structures</p> | <ul style="list-style-type: none"> • Beams • Columns • Footings • Slabs • Walls • Cantilevers • Zones • Abutment • Pile caps |
| <p>4. Describe the properties of reinforcing systems</p> | <ul style="list-style-type: none"> • Grade strengths and diameter (metric and imperial) • Types <ul style="list-style-type: none"> ○ Weldable ○ Non-weldable ○ Stainless ○ Glass fibre bar (GFRP) ○ Welded wire mesh ○ Smooth bar ○ Deformed bar ○ Pre-stressing strand/bar ○ Stud rails/shear studs ○ Embeds • Coatings <ul style="list-style-type: none"> ○ Galvanized ○ Epoxy • Shape and placement of steel |

LEARNING TASKS

5. Describe the principles of reinforced concrete

CONTENT

- Bonding of concrete to steel
- Location and shape of steel
- Concrete coverage
- Development length

Line (GAC): G APPLY REINFORCING TECHNIQUES

Competency: G2 Install and Fabricate Reinforcing Material

Objectives

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

- Identify reinforcing materials.
- Splice reinforcing material.
- Install reinforcing material.

LEARNING TASKS

1. Identify reinforcing material

2. Install reinforcing material

3. Splice reinforcing material

4. Secure reinforcing material

CONTENT

- Size, grade, length and shape
- Supplier identification markings
 - Tags
 - Colour codes
 - Shipping list (bar list)
- Detail sheets and placing drawings
- Proper lifting and handling
- Dowel/end protection
- Installation methods
 - Built-in-place
 - Pre-fabricated
- Layout
- Measuring, marking and cutting
- Framing up
 - Types of support
 - Chairs
 - Bolsters
 - Bricks
 - Standees
 - Post and saddles
 - Sway braces
 - Pin bracing
 - Box braces
 - Tying back
- Installing balance of steel
- Types of rebar splices
 - Lap
 - Length requirements
 - Contact
 - Non-contact
 - Mechanical
 - Welded
- Types of wire

LEARNING TASKS

CONTENT

- Materials
- Gauges
- Coatings
- Types of ties
- Purposes/selection of ties
- Tying specifications and percentages
- Tying sequence
- Tools and equipment
- Muffler clamps
- Welding

Achievement Criteria

- | | |
|-------------|--|
| Performance | The learner will install reinforcing steel according to verbal instructions. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • Instructions • Materials |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy of bar location • Required number of bars and shapes in proper location • Proper interpretation of the information that is provided by the instructor • Quality of installation • Timeliness |

Line (GAC): H APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES

Competency: H1 Describe Principles of Pre-Stressed Systems

Objectives

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

- Describe pre-stressed systems.
- Describe pre-stressed systems and accessories.
- Describe pre-stressing equipment.
- Describe installation of anchorages.
- Describe organization and protection of tendons and accessories.
- Describe pre-stressed members.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe pre-stressed systems</p> | <ul style="list-style-type: none"> • Purpose and advantages • Principles <ul style="list-style-type: none"> ○ Effects of rebar and cable on structure • Importance of material tracking • Importance of quality assurance • Applications <ul style="list-style-type: none"> ○ Floor systems ○ Girders ○ Columns ○ Bridges ○ Temporary structures ○ Cable supported structures ○ Barricades |
| <p>2. Describe pre-stressed systems and accessories</p> | <ul style="list-style-type: none"> • Stressing bed <ul style="list-style-type: none"> ○ Forms ○ Self-stressing ○ Fixed abutment • Tendons <ul style="list-style-type: none"> ○ Grades ○ Bar ○ Cable/strand ○ Sizes • Accessories <ul style="list-style-type: none"> ○ Anchors ○ Wedges ○ Nuts/plates ○ Bursting bars ○ Bullets |
| <p>3. Describe pre-stressing equipment</p> | <ul style="list-style-type: none"> • Jacks • Grippers • Pumps • Gauges • Hoses • Seating tools |

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>4. Describe installation of anchorages</p> <p>5. Describe organization and protection of tendons and accessories</p> <p>6. Describe pre-stressed members</p> | <ul style="list-style-type: none"> • Shears • Iso-tensioning box(sequence) • De-tensioning • Winches • Strand pullers/pusher • Winches • Straw line/fish wire • Cutting bed • De-coiler/Lazy Susan • Sheath cutters • Power source
 • Layout <ul style="list-style-type: none"> ○ Tolerances • Attachments • Anchorages <ul style="list-style-type: none"> ○ Single strand ○ Multi strand • Types of anchor zone reinforcement <ul style="list-style-type: none"> ○ Bursting steel ○ Spiral/coil ○ Grillage
 • Materials <ul style="list-style-type: none"> ○ Duct tape ○ Heat shrink ○ Tarps ○ Oil/grease/wax ○ Caulking ○ Tags and colour coding • Site storage • Potential contaminants • Fault identification and correction • Installation of tendon protection • Rigging and handling considerations
 • Types of members <ul style="list-style-type: none"> ○ Hollow core ○ Tee/double tee ○ Inverted tee ○ Columns ○ Beams/girders ○ Slab ○ Spandrels/fascia panels |
|---|---|

Line (GAC): H APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES
Competency: H2 Place Unbonded Post-Tensioning Systems

Objectives

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

- Describe unbonded post-tensioning systems.
- Describe the stressing of tendons.
- Describe the cutting, capping and grouting of tendons.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe unbonded post-tensioning systems</p> | <ul style="list-style-type: none"> • Structural applications • Reinforced concrete applications • Strand <ul style="list-style-type: none"> ○ Sheathed <ul style="list-style-type: none"> – Greased – Non-greased • Anchorage systems <ul style="list-style-type: none"> ○ Multi-strand ○ Mono-strand ○ Bars • Accessories <ul style="list-style-type: none"> ○ Pocket formers ○ Staples ○ Chairs/bolster ○ Grease caps ○ Chimneys |
| <p>2. Describe placing tendons</p> | <ul style="list-style-type: none"> • Sequence of work <ul style="list-style-type: none"> ○ Identifying placing order ○ Layout, measuring and marking considerations ○ Anchor and pocket formers considerations ○ Bursting steel installation considerations ○ Installation of tendons <ul style="list-style-type: none"> – Manual rolling out – Power feeding ○ Securing dead ends ○ Supporting tendons <ul style="list-style-type: none"> – Securing tendons to supports – Spacing considerations • Ensuring adequate projection on live ends • Quality assurance as per project specifications |
| <p>3. Describe preparation of tendons for stressing</p> | <ul style="list-style-type: none"> • Identifying time lines • Ensuring concrete strength |

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>4. Describe stressing tendons</p> <p>5. Describe cutting and capping tendons</p> <p>6. Describe specifications and standards</p> | <ul style="list-style-type: none"> • Inspecting for concrete deficiencies • Removing pocket formers • Inspecting anchorage • Inspecting tendon • Cutting and removing sheathing • Installing grippers and wedges • Cleaning tendon • Debris removal • Marking tendon
 • Safety <ul style="list-style-type: none"> ○ Tie off jack ○ Setup of control zone • Preparing/inspecting/cleaning equipment • Equipment function verification • Calibrated equipment pairing • Identification of sequence • Installing jack • Stressing to required pressure • Checking elongation • Documentation • Approval of results
 • Cutting methods <ul style="list-style-type: none"> ○ Torch ○ Pocket shear ○ Abrasive cut-off ○ Plasma cutter • Cleaning pocket • Capping <ul style="list-style-type: none"> ○ Grouting ○ Waxing ○ Greasing
 • Post Tensioning Institute (PTI) • Project specific • Manufacturer specific • Anchor spacing • Double live ends • Intermediate anchorage |
|---|---|

Level 2

Ironworker (Generalist)

Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B2 Use Measurement and Layout Tools**

Objectives

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

- Use levelling equipment.

LEARNING TASKS

1. Review Level 1
2. Use a Builder’s level

CONTENT

- As per Level 1 content
- Parts and components
- Set up procedure
- Checking the instrument for accuracy
- Select best position for set up based on task
- Determine instrument height
- Procedures for determining object elevation
- Procedure for transferring elevations
- Procedures required for multiple set ups
- Care, storage and handling

Achievement Criteria

Performance	The learner will verify accuracy of instrument and reference a known bench mark, to establish various elevations and transfer an elevation in a total circuit requiring multiple set ups.
Conditions	The learner will be given: <ul style="list-style-type: none"> • Builder’s level • Rod holder • Instructions • A bench mark
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B4 Use Welding and Cutting Tools

Objectives

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

- Describe welding processes.
- Perform SMAW.
- Perform oxy fuel cutting.
- Perform gouging.
- Identify welding joints and positions.
- Describe weld testing and defects.
- Prepare a test plate and perform CWB SMAW.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Review Level 1 2. Describe welding processes 3. Perform SMAW 4. Perform oxy fuel cutting | <ul style="list-style-type: none"> • As per Level 1 content • Standards <ul style="list-style-type: none"> ○ CWB ○ CSA ○ AWS • Flux core arc welding (FCAW) • Tungsten inert gas welding (TIG) • Metal inert gas welding (MIG) • Submerged arc welding (SAW) • Shielded metal arc welding (SMAW) • Stud welding (SW) • Materials • Consumables • Procedures • Set up • Adjustment • Maintenance • Inspection • Trouble shooting • Storage and handling • Equipment <ul style="list-style-type: none"> ○ Standard hand torch ○ Track burner ○ Manifold system • Set up • Adjustment • Maintenance • Inspection • Trouble shooting • Storage and handling |
|--|---|

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>5. Perform gouging</p> | <ul style="list-style-type: none"> • Equipment • Materials • Consumables • Procedure • Set up • Adjustment • Maintenance • Inspection • Storage and handling |
| <p>6. Identify welding joints and positions</p> | <ul style="list-style-type: none"> • Joints <ul style="list-style-type: none"> ○ Tee ○ Lap ○ Butt ○ Corner ○ Edge • Positions <ul style="list-style-type: none"> ○ Flat ○ Horizontal ○ Vertical (up) ○ Overhead • Groove • Fillet • Puddle • Symbols |
| <p>7. Describe weld testing and defects</p> | <ul style="list-style-type: none"> • Non-destructed testing (NDT) <ul style="list-style-type: none"> ○ Ultra sonic ○ Meg particle ○ X-ray • Destructive testing (DT) <ul style="list-style-type: none"> ○ Guided bend test • Cracking • Lack of fusion |
| <p>8. Recognize conditions that could cause weld defects</p> | <ul style="list-style-type: none"> • Pre heat • Post heat • Proper penetration of joints |

Achievement Criteria #1

Performance	The learner will prepare a 1G and 2G CWB SMAW test plate.
Conditions	The learner will be given: <ul style="list-style-type: none">• Oxy fuel track burning equipment• Grinder• Welder• Material• Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Dimensions of plate• Degree of bevel• Dimension of gap• Degree of finish

Achievement Criteria #2

Performance	The learner will perform CWB SMAW in 1G and 2G positions and prepare coupons for destructive testing as per standards.
Conditions	The learner will be given: <ul style="list-style-type: none">• Prepared plate• Welder• Electrodes• Gouging equipment and grinder• Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Visual inspection of completed plate• Visual inspection of completed coupons• Result of destructive testing

Line (GAC): C ORGANIZE WORK

Competency: C1 Use Mathematics

Objectives

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

- Apply mathematical principals to solve problems.

LEARNING TASKS

1. Review Level 1
2. Solve mathematical problems
3. Apply mathematical principals to daily projects

CONTENT

- As per Level 1 content
- Working bevel
- Metric and imperial
- Arc
- Chord
- Degrees, minutes and seconds
- Lift plan
 - Dimensions
 - Head room
 - Capacity
 - Weight
 - Angles
- Building layout
 - Dimensions
 - Angles
 - Elevations
- Pressure displacement
 - Area
 - Weight

Line (GAC): C **ORGANIZE WORK**
Competency: C2 **Interpret Drawings and Specifications**

Objectives

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

- Identify structural requirements based on erection drawings.
- Identify welding symbols.
- Identify reinforcing requirements based on reinforcing steel drawings.
- Determine structural requirements for an erection drawing.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Review Level 1 | <ul style="list-style-type: none"> • As per Level 1 content |
| 2. Identify structural requirements based on erection drawings | <ul style="list-style-type: none"> • Bolt list/schedule • Weld symbols • Piece orientation/location/direction • Piece number • Elevations • Connection types • Structural designations • Material types • Material finish |
| 3. Identify welding symbols | <ul style="list-style-type: none"> • Orientation • Weld specification • Preparation • Field weld |
| 4. Identify reinforcing requirements based on reinforcing steel drawings | <ul style="list-style-type: none"> • Quantity • Location • Spacing • Size • Shape/type • Placing order • Clearances • Splice lengths • Projection • Embedment |

Achievement Criteria #1

- Performance** The learner will determine reinforcing requirements from a drawing and determine quantity, size, spacing and placing order.
- Conditions** The learner will be given:
- Drawing
 - Instructions
- Criteria** The learner will score 70% or better on a rating sheet that reflects the following criteria:
- Size
 - Quantity
 - Location
 - Placing order

Achievement Criteria #2

- Performance** The learner will determine structural requirements from an erection drawing and determine quantity, piece count, location and sequence for erection.
- Conditions** The learner will be given:
- Drawing
 - Instructions
- Criteria** The learner will score 70% or better on a rating sheet that reflects the following criteria:
- Piece numbers
 - Piece count
 - Location
 - Elevation
 - Orientation
 - Sequence
 - Bolt list

Line (GAC): **D USE RIGGING, HOISTING AND LIFTING EQUIPMENT**
Competency: **D1 Use Ropes and Slings**

Objectives

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

- Use ropes, slings and hitches (fibre and wire) for rigging.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Review Level 1 2. Use slings and hitches according to configurations and appropriate formulas 3. Use fibre ropes 4. Inspect fibre rope, wire rope and slings | <ul style="list-style-type: none"> • As per Level 1 content • Vertical/multiple leg • Baskets/D-to-D ratio • Choker hitches/angle of choke • Bridle hitches/multiple leg bridles • Tension and safe working loads according to multiple configurations • Multiple leg bridle tensions • Eye configuration and efficiency • Inspection and storage • Splices and knots • Damage <ul style="list-style-type: none"> ○ Deformations ○ Cuts and abrasions ○ Broken wires ○ Corrosion ○ Chemical ○ UV • Wear indicators • Inspection report • Action required |
|--|---|

Achievement Criteria #1

- Performance The learner will use knots in a practical application.
- Conditions The learner will be given:
- Equipment
 - Instructions
- Criteria The learner will score 70% or better on a rating sheet that reflects the following criteria:
- Selection of knot for the given scenario.
 - Speed
 - Accuracy
 - Tail length and finish

Achievement Criteria #2

- Performance The learner will perform a rigging inspection and create a written inspection report.
- Conditions The learner will be given:
- Sample rigging
 - Log sheet/book
 - Instructions
- Criteria The learner will score 70% or better on a rating sheet that reflects the following criteria:
- Accuracy of written inspection report

Line (GAC): D USE RIGGING, HOISTING AND LIFTING EQUIPMENT

Competency: D2 Use Rigging and Hoisting Equipment

Objectives

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

- Select and use hoisting and rigging equipment.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Review Level 1 2. Describe rigging hardware | <ul style="list-style-type: none"> • As per Level 1 content • Drums <ul style="list-style-type: none"> ○ Drums/fleet angle ○ Installation of rope on grooved and plain drums ○ Transfer of line from spool to drum • Blocks <ul style="list-style-type: none"> ○ Snatch blocks ○ Multi-sheaved blocks <ul style="list-style-type: none"> – Laced – Reeved ○ Traveling blocks/standing blocks ○ Sheave size ○ Bushing/bearing |
| <ol style="list-style-type: none"> 3. Select and use hoisting and rigging equipment | <ul style="list-style-type: none"> • Calculation of weight • Length of material • Transfer of load • Selection of lifting location or point • Anchorage and hold back • Mechanical advantage • Lead line pull • Compound friction • Angle factors • Operating procedures • Inspection |

Achievement Criteria

- | | |
|-------------|---|
| Performance | The learner will be able to perform a multi-part fibre rope reeve-up. |
| Conditions | The learner will be given: <ul style="list-style-type: none">• Two multi-sheave blocks• Fibre rope• Instructions |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Speed• Routing of rope• Installation of becket |

Line (GAC): E APPLY CRANE WORK PROCEDURES

Competency: E1 Assemble and Disassemble Cranes

Objectives

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

- Describe conventional crane assembly/disassembly for crawler/mobile.
- Set up a crane.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Review Level 1 2. Describe conventional crane assembly/disassembly 3. Set up a crane | <ul style="list-style-type: none"> • As per Level 1 content • Transportation considerations • Components • Required tools and equipment • Assembly area/disassembly area • Hazards • Sequence of assembly/disassembly <ul style="list-style-type: none"> ○ Blocking/cribbing location • Rigging procedures • Jib installation and stowage • Signals/communication with crane operator • Reeve/lace blocks • Finalizing the set up • Inspection • According to manufacturer’s specifications |
|---|---|

Line (GAC): F ERECT STRUCTURAL MEMBERS

Competency: F2 Install Structural Members

Objectives

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

- Describe and use levelling, plumbing and alignment techniques for structural members.
- Describe Q-decking installation and its function.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Review Level 1</p> | <ul style="list-style-type: none"> • As per Level 1 content |
| <p>2. Use levelling, plumbing and alignment techniques for structural members</p> | <ul style="list-style-type: none"> • Considerations for multi-bay welded structures • Temporary X brace installation and procedure • Removal of temporary lines • Off-set lines • Plumbing and alignment equipment • Plumbing and aligning techniques and tolerances • Surveying equipment – lasers and theodolite and total stations |
| <p>3. Describe Q-decking installation and its function</p> | <ul style="list-style-type: none"> • Diaphragm • Material support • Types • Gauges, profiles and finishes • Fastening methods • Installation procedures • Hoisting • Handling • Fall arrest procedures • Quality assurance |

Line (GAC): F **ERECT STRUCTURAL MEMBERS**
Competency: F3 **Install Ornamental Components and Systems**

Objectives

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

- Describe installation techniques of miscellaneous components.
- Apply installation techniques.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Describe installation techniques of miscellaneous components</p> | <ul style="list-style-type: none"> • Railings, stairs and landings <ul style="list-style-type: none"> ○ Parts and types ○ Installation procedures ○ Rigging considerations ○ Fastening methods ○ Codes and bylaws ○ Procedure for determining length ○ Procedure for determining height ○ Modifications ○ Field fabrication ○ Degree of finishing ○ Protection of surrounding materials |
| <p>2. Apply installation techniques for miscellaneous components and systems</p> | <ul style="list-style-type: none"> • According to job specifications |

Achievement Criteria

- | | |
|--------------------|--|
| Performance | The individual will plan and field build stairs and a railing. |
| Conditions | The individual will be given: <ul style="list-style-type: none"> • Materials • Tools • Instructions |
| Criteria | The individual will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy of layout • Accuracy of fit-up • Degree of finish |

Line (GAC): **G APPLY REINFORCING TECHNIQUES**

Competency: **G1 Apply Principles of Reinforcing Concrete**

Objectives

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

- Use reinforcing codes and standards.

LEARNING TASKS

1. Review Level 1
2. Use reinforcing codes and standards

CONTENT

- According to Level 1 content
- CSA standards
- RSIC standards
- CRSI standards
- Project specific standards
- Fabrication standards
 - Bending tolerances
 - Standard shapes
- Clearance
- Splices
 - Types
 - Classes

Line (GAC): G APPLY REINFORCING TECHNIQUES

Competency: G2 Install and Fabricate Reinforcing Material

Objectives

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

- Detail, fabricate and install reinforcing material using a blueprint or placing sheet.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Review Level 1 2. Detail, fabricate and install rebar from a structural drawing or similar source | <ul style="list-style-type: none"> • As per Level 1 content • Location of work to be performed • List of materials • Placing order and support requirements • Measure, mark, cut, place, tie |
|---|---|

Achievement Criteria

- | | |
|-------------|---|
| Performance | The learner will detail, fabricate and install rebar components from a drawing. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • Instructions • Drawing • Materials • Bender |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Proper cover • Accuracy of fabrication • Accuracy of placement • Projection • Quality of tying • Timeliness |

Line (GAC): H APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES
Competency: H3 Place Bonded Post-Tensioning Systems

Objectives

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

- Describe bonded post-tensioning systems.
- Describe the placing ducts and anchors and tendons.
- Describe the preparation of tendons for stressing.
- Describe the stressing of tendons.
- Describe the cutting, capping and grouting of tendons.
- Install a multi-strand PT system.

LEARNING TASKS

1. Describe bonded post-tensioning systems

CONTENT

- Structural applications
- Reinforced concrete applications
- Tendon
 - Grade
 - Bar
 - Cable
- Anchorage systems
 - Multi-strand
 - Mono-strand
 - Bell/plate
- Accessories
 - Duct
 - Pocket formers
 - Chairs/bolster
 - Caps
 - Trumpet
 - Grout vents
 - Grout tubes
 - Wedges
- Adequate support
- Profile of duct
- Sealing/attaching
- Taping/heat sealing
- Couplers and clamps
- Attaching grout tubes
- Securing the ducts
- Bursting steel installation considerations
- Location of anchorages
- Adequately securing anchors to bulkhead

2. Describe placing ducts and anchors

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 3. Describe placing tendons | <ul style="list-style-type: none"> • Sequence of work • Installation methods <ul style="list-style-type: none"> ○ Manual rolling out ○ Power feeding • Ensuring adequate projection on live ends • Quality assurance as per project specifications |
| 4. Describe preparation of tendons for stressing | <ul style="list-style-type: none"> • Ensuring concrete strength • Inspecting for concrete deficiencies • Inspecting anchorage • Inspecting tendon • Separation of tendons • Cleaning tendon • Installing anchors and wedges • Debris removal • Marking tendon |
| 5. Describe stressing tendons | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ Tie off jack ○ Setup of control zone • Preparing/inspecting/cleaning equipment • Equipment function verification • Calibrated equipment pairing • Identification of sequence • Installing jack • Stressing to remove slack • Stressing to required pressure • Checking elongation • Documentation • Approval of results |
| 6. Describe cutting and capping tendons | <ul style="list-style-type: none"> • Cutting methods <ul style="list-style-type: none"> ○ Torch ○ Abrasive cut-off • Capping <ul style="list-style-type: none"> ○ Grouting ○ Caulking |
| 7. Describe grouting tendons | <ul style="list-style-type: none"> • Purpose • Composition/mixing • Equipment • Testing • Venting • Pumping • Capping |

LEARNING TASKS

8. Describe specifications and standards

CONTENT

- Post Tensioning Institute (PTI)
- Project specific
- Manufacturer specific
- Double live ends

Achievement Criteria

- | | |
|-------------|--|
| Performance | The individual will install a multi-strand PT system including duct, tendon and anchorage in preparation for stressing. |
| Conditions | The individual will be given: <ul style="list-style-type: none"> • Instructions • Drawing • PT duct, accessories and tools • PT tendon |
| Criteria | The individual will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Adherence to the drawing • Sealing of the duct • Installation of anchor and wedges • Tail projection • Location of grout vents • Timeliness |

Line (GAC):	I	MAINTAIN AND UPGRADE STRUCTURAL STEEL AND COMPONENTS
Competency:	II	Make Repairs and Revisions

Objectives

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

- Identify the current condition of components.
- Field-fabricate components.
- Replace components.

LEARNING TASKS

1. Describe the revision process

2. Field-fabricate components

CONTENT

- Identify problem
 - Fabrication errors
 - Material properties
 - Handling damage
 - Design change
- Approval process
 - Field engineer
 - Designer
 - Supervisor
- Request for information (RFI)
- Change order
- Back charge
- Policies and procedures
- Revised drawings
- Documentation
- Temporary supports
 - Columns
 - Falsework
 - Hangars
 - Rigging
- Access and egress
- Labour requirements
- Time line
- Application of standards
- Fabrication tolerances
- Material requirements
- Documentation
- Quality assurance

Level 3 Ironworker (Generalist)

Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B2 Use Measurement and Layout Tools**

Objectives

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

- Use levelling equipment /theodolite (standard and laser).

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Review Level 2 2. Use a theodolite 3. Use layout equipment to verify the accuracy of the layout provided | <ul style="list-style-type: none"> • Content as per Level 2 • Parts and components • Setting up instrument over a given point • Checking the instrument for accuracy • Selecting best position for set up based on task • Procedures for determining object elevation based on vertical triangulation • Care/storage and handling • Laser level • Remaining within clearance tolerances • Proper setup and placement of level |
|---|---|

Achievement Criteria

- | | |
|-------------|--|
| Performance | The learner will use an offset line and a theodolite to identify column location and elevation. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • Work point • Drawing • Theodolite • Instructions • Partner |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Proper set-up • Accuracy of the layout |

Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B4 Use Welding and Cutting Tools**

Objectives

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

- Perform CWB weld.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Review Levels 1 and 2 2. Perform CWB weld | <ul style="list-style-type: none"> • As per Level 1 and 2 content • Vertical up and overhead positions |
|---|--|

Achievement Criteria

- | | |
|--------------------|---|
| Performance | The learner will weld material and prepare coupons for destructive testing as per CWB standards in vertical up and overhead positions. |
| Conditions | <p>The learner will be given:</p> <ul style="list-style-type: none"> • Materials • Equipment • Instructions |
| Criteria | <p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"> • Visual inspection • Guided bend test inspection • Adherence to CWB specifications |

Line (GAC): **C ORGANIZE WORK**
Competency: **C1 Use Mathematics**

Objectives

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

- Apply mathematical principals to solve problems.

LEARNING TASKS

1. Review Levels 1 and 2
2. Solve multi-step problems using mathematical concepts as learned in Levels 1 and 2

CONTENT

- As per Level 1 and 2
- Word and diagram problems
 - Material weights
 - Triangulation of cranes
 - Below-the-hook rigging triangles
 - Capacity
 - Calculate hopper dimensions

Line (GAC): C **ORGANIZE WORK**
Competency: C2 **Interpret Drawings and Specifications**

Objectives

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

- Interpret structural drawings.
- Interpret post-tensioning drawings.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Review Level 2 content 2. Interpret structural drawings 3. Interpret post-tensioning drawings | <ul style="list-style-type: none"> • As per Level 2 content • Abbreviations • General notes • Revisions • Orientations • Details • Gridlines • Title block • Dimensions • Sections • Views and elevations • Specifications • Schedules • Anchorages <ul style="list-style-type: none"> ○ Live end ○ Dead end ○ Intermediate • Tendon placing order • Stressing sequence • Anticipated elongation • Tendon schedule • Tendon profile • Support systems • Anchor zone reinforcing • Vent locations • Duct sizes • Wedge dimensions • Anchor dimensions |
|--|---|

Line (GAC): **D USE RIGGING, HOISTING AND LIFTING EQUIPMENT**
Competency: **D1 Use Ropes and Slings**

Objectives

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

- Select appropriate slings based on application.

LEARNING TASKS

1. Review Level 2
2. Select appropriate slings based on application

CONTENT

- As per Level 2 content
- Unequal leg lengths
- Unsymmetrical loads
- Dynamic loads

Line (GAC): D USE RIGGING, HOISTING AND LIFTING EQUIPMENT
Competency: D2 Use Rigging and Hoisting Equipment

Objectives

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

- Select equipment based on transfer of load.
- Calculate and select highline equipment based on loads.
- Calculate a reeve system.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Review Level 2 2. Select equipment based on transfer of load | <ul style="list-style-type: none"> • As per Level 2 content • Transfer of loads <ul style="list-style-type: none"> ○ Distance of transfer ○ Calculation of size/weight ○ Communication ○ Securing of loads • Operating procedures • Inspection • Maintenance • Storage • Selection of lifting location or point • Incline plane • Drifting • Anchorage and holdbacks • Safety |
| <ol style="list-style-type: none"> 3. Calculate and select highline equipment based on the loads | <ul style="list-style-type: none"> • Calculation of capacity • Calculation of weight • Calculation of high line tensions • Load holdback • Securing of loads • Incline plane • Anchorage and holdbacks • Safety |

Achievement Criteria (suggested group activity) #1

Performance	The learner will design a plan and work with a group to install a reeve system for a given task.
Conditions	The learner will be given: <ul style="list-style-type: none"> • Tugger • Task objective • Variety of available equipment
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Appropriate plan • Winch/power source placement • Appropriate fleet angle • Lead block location • Routing of cable • Appropriate mechanical advantage • Selection of block design and capacity • Accurate determination of holdbacks • Load control • Selection of slings and attachments • Headroom • Communication

Achievement Criteria (suggested group activity) #2

Performance	The learner will design and work with a group to implement a rigging plan to transfer a load horizontally and/or between elevations.
Conditions	The learner will be given: <ul style="list-style-type: none"> • Task objective • Variety of available equipment
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Selection of equipment • Selection of rigging and attachments • Accurate hold back calculation • Load control • Headroom • Communication

Line (GAC): D USE RIGGING, HOISTING AND LIFTING EQUIPMENT
Competency: D3 Use Mechanical Moving Equipment

Objectives

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

- Move a load using jacks and rollers.

LEARNING TASKS

1. Review Level 1
2. Move a load using jacks and rollers

CONTENT

- As per Level 1 content
- Procedures
- Location/positioning of jacks/rollers
- Holdback considerations
- Base conditions
 - Decline/incline
- Coefficients of friction
- Size, type and number of jacks/rollers depending on load
- Weight considerations
- Rigging considerations
- Blocking
- Centre of gravity
- Safety
- Communication
- Maintenance
- Storage
- Handling

Achievement Criteria

Performance	The learner will jack and move an object between two positions at different angle orientations.
Conditions	The learner will be given: <ul style="list-style-type: none">• The task description• Variety of equipment and materials
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Development of the plan• Choice of jack, quantity, position• Choice of blocking, quantity, position• Placement of rollers• Choice of power source• Choice of rigging and attachments• Load control• Holdbacks• Jack down• Accuracy of final position

Line (GAC): **E APPLY CRANE WORK PROCEDURES**
Competency: **E1 Assemble and Disassemble Cranes**

Objectives

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

- Describe assembly/disassembly for tower cranes.
- Apply procedures for tower crane set up.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Review Level 2 2. Describe tower crane assembly/disassembly 3. Apply procedures for tower crane set up | <ul style="list-style-type: none"> • As per Level 2 content • Hazards • Required tools and equipment • Sequence of assembly/disassembly • Rigging procedures • Installation of components • Bolting and torqueing procedures • Finalize the set up • Inspection • According to manufacturer’s requirements |
|---|--|

Line (GAC): E **APPLY CRANE WORK PROCEDURES**
Competency: E2 **Apply Lifting Practices for Cranes**

Objectives

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

- Analyze critical lift plans.
- Identify marine hoisting equipment.
- Describe marine loading and unloading.
- Identify safety practices for heavy rigging and marine rigging.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Review Level 1 | <ul style="list-style-type: none"> • As per Level 1 content |
| 2. Analyze critical lifts | <ul style="list-style-type: none"> • Safety procedures • Hoisting personnel • Near limit capacities • Counter balanced lifts • Tandem/multi crane lifts • Non-routine lifts • Coordination <ul style="list-style-type: none"> ○ Pre-planning ○ Pre-lift meeting ○ Equipment conflicts ○ Changing weather conditions • Centre of gravity <ul style="list-style-type: none"> ○ Components ○ Configurations |
| 3. Identify marine hoisting equipment | <ul style="list-style-type: none"> • Floating derricks • Barge crane • Spud barges • Ship cranes • Container cranes • Slew winches |
| 4. Identify marine hoisting considerations | <ul style="list-style-type: none"> • Barge list and trim • Free board • Environmental • Tide lifts • Currents • Wakes • Tide book • Crane charts based on barge configuration |

Line (GAC): F **ERECT STRUCTURAL MEMBERS**
Competency: F2 **Install Structural Members**

Objectives

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

- Describe types of wooden structural components.
- Describe types of pre-cast structures and components.
- Layout and fabricate a structural assembly.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Review Level 2 2. Describe types of wooden structural components 3. Describe types of pre-cast structures and components | <ul style="list-style-type: none"> • As per Level 2 content • Types <ul style="list-style-type: none"> ○ Glue laminated beams ○ Solid wood beams • Ordering and shipping considerations • Storage and handling considerations • Rigging procedures • Fastening methods • Installation procedures • Ordering and shipping considerations • Storage and handling considerations • Rigging procedures • Fastening methods • Installation procedures • Embedded anchors • Temporary lifting attachments • Bearing points • Temporary bracing • Alignment and survey • Pockets and inserts • Caulking and epoxies |
|---|--|

Achievement Criteria

Performance	The learner will layout and fabricate a structural assembly that includes columns, beams, braces, and connection plate locations.
Conditions	The learner will be given: <ul style="list-style-type: none"> • Drawing • Materials • Instructions • Tools and equipment
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy of the material cut list • Accuracy of the template for angled brace connections • Quality and squareness of cuts • Piece dimensions • Overall assembly dimensions • Location of clips (connection plates) • Location of bolt holes • Squareness of assembly • Adherence to schedule

Line (GAC): F **ERECT STRUCTURAL MEMBERS**
Competency: F3 **Install Ornamental Components and Systems**

Objectives

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

- Describe curtain wall components and systems.
- Describe curtain wall installation.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Review Level 2 2. Identify the types curtain wall 3. Describe curtain wall installation procedures | <ul style="list-style-type: none"> • As per Level 2 content • Unitized • Stick-built • Aluminum and glass • Insulated panels • Shipping and receiving • Rigging and handling • Layout and survey • Installation sequence • Caulking and sealants • Support members • Fastening • Dissimilar metals • According to job specifications • Quality assurance |
|---|---|

Line (GAC): F **ERECT STRUCTURAL MEMBERS**
Competency: F4 **Install Conveyers, Machinery and Equipment**

Objectives

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

- Describe conveyance systems and parts.
- Describe track adjustments.
- Fabricate a hopper.

LEARNING TASKS

1. Describe conveyance systems

CONTENT

- Safety
 - Lockout procedures
 - Emergency stop
 - Sirens and lights
 - Personnel guards
- Types
 - Bucket
 - Belt
 - Chain
 - Screw
 - Personnel
- Direction of movement
 - Vertical
 - Horizontal
 - Incline
 - Decline
 - Circular
- Parts
 - Idlers
 - Pulleys
 - Take ups
 - Belts
 - Chains
 - Chutes
 - Drives
 - Motors
 - Hopper
 - Chutes
 - Support structures

2. Describe track adjustments

- Head pulley
- Tail pulley
- Idlers

3. Fabricate a hopper

- Equal side hoppers
- Unequal side hoppers

LEARNING TASKS

CONTENT

- Layout of sides
 - Elevations
 - Calculated true length of sides
 - Inside, outside and corner fit

Achievement Criteria

- | | |
|-------------|--|
| Performance | The learner will fabricate a hopper according to scale size specification. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • Directions • Drawing • Materials • Equipment |
| Criteria | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Accuracy of finish elevations bottom to top • Accuracy of intake opening and exhaust opening dimensions • Accuracy of true length sides • Accuracy of fit up |

Line (GAC): **G APPLY REINFORCING TECHNIQUES**
Competency: **G1 Apply Principles of Reinforcing Concrete**

Objectives

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

- Calculate bend allowance and stretch-out.

LEARNING TASKS

1. Review Level 2
2. Calculate bend allowances

CONTENT

- According to Level 2 content
- Detail sheet
- Cut sheet
- Overall length of bar
 - Side lengths, radius, tail length, bend types
- Pin diameter

Achievement Criteria

Performance	The learner will determine reinforcing requirements in a given area from a structural drawing and detail a simple component.
Conditions	The learner will be given: <ul style="list-style-type: none"> • Structural drawing • Blank detail sheet • Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Size • Quantity • Shape • Grade • Length of bent dimensions • Overall lengths • Spacing • Placing order • Accuracy of detail sheet

Line (GAC): **H APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES**
Competency: **H2 Place Unbonded Post-Tensioning Systems**

Objectives

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

- Describe reasons for de-stressing.
- Describe de-stressing requirements.
- Apply procedures for placing post-tensioning systems.
- Layout and place tendons from a PT drawing.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Review Level 1</p> | <ul style="list-style-type: none"> • As per Level 1 content |
| <p>2. Describe reasons and procedures for de-stressing (for new construction)</p> | <ul style="list-style-type: none"> • Blowout in concrete • Procedures <ul style="list-style-type: none"> ○ Identify potential hazards ○ Restrict work zone access ○ Ensure engineered shoring is in place ○ Follow engineering procedures |
| <p>3. Describe de-stressing requirements</p> | <ul style="list-style-type: none"> • Equipment <ul style="list-style-type: none"> ○ Jack ○ Pump ○ Gauges ○ Hoses ○ De-stressing chair ○ Needle nose pliers • Procedures <ul style="list-style-type: none"> ○ Chair ○ Jack ○ Awareness of ram length ○ Stroking variation (pressure) |
| <p>4. Apply procedures for placing post-tensioning systems</p> | <ul style="list-style-type: none"> • According to job requirements <ul style="list-style-type: none"> ○ Procedures ○ Equipment ○ Safety |

Achievement Criteria

Performance	The individual will layout and place tendons according to a PT placing drawing.
Conditions	The individual will be given: <ul style="list-style-type: none">• Instructions• PT placing drawing• PT equipment and accessories• PT tendons• Layout equipment• Tools
Criteria	The individual will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none">• Accuracy of anchorage• Quality of attachments• Adherence to the drawing• Installation of bursting steel• Timeliness• Storage and handling

Line (GAC):	I	MAINTAIN AND UPGRADE STRUCTURAL STEEL AND COMPONENTS
Competency:	I2	Dismantle and Remove Structural, Mechanical and Miscellaneous Components

Objectives

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

- Plan and replace or upgrade a structural member.

LEARNING TASKS

1. Review Level 2
2. Plan the procedure to remove a structural member

CONTENT

- As per Level 2 content
- Parts to be removed
- Implication of removal
- Equipment resources
- Properties of components
 - Piece weight
 - Material integrity
 - Additional weight factors
- Identification of fastening
- Safety
 - Airborne hazards
 - Falling objects
 - Fire hazards
 - Pinch points
 - Stored energy
 - Control zones
- Coordination/sequence
- Required permits/approval
- Temporary support/bracing

Achievement Criteria (suggested as a group activity)

Performance	The individual will plan and work with a group to remove a structural component from an existing structure.
Conditions	The individual will be given: <ul style="list-style-type: none"> • Instructions • Drawing • Equipment • Access to existing structure
Criteria	The individual will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> • Calculation of weight • Documentation of plan • Control of hazards • Calculation of rigging requirement

Section 4

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- N/A

Shop Area

- Comfortable seating and tables suitable for learning
- Compliance with the local and national fire code and occupational safety requirements
- Overhead and multimedia projectors with a projection screen
- Whiteboard with marking pens and erasers
- Lighting controls to allow easy visibility of the projection screen while allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/air conditioning for comfort all year round
- In-room temperature control to ensure comfortable room temperature
- Acoustics in the room must allow audibility of the instructor
- Computer lab complete with 16 computers and internet access
- Library complete with reference material for student and instructor use
- 1,100 square foot sheet metal workshop with ceiling height sufficient to allow safe movement of materials
- 15,000 square foot outdoor practical area which includes:
 - Sufficient area to set up a mobile crane
 - Sufficient area to set up a structural mock-up
 - Multi-level structure in excess of 35 ft.
 - Cast anchor bolts
 - A variety of structural members and connections
- Tool crib
- Lockers
- Adequate lighting and lighting control
- 16 individual welding booths (30 sq. ft. each) with UV partitions and adequate air exchange
- Ventilation as per WorkSafeBC standards
- Refuse and recycling bins for used shop materials
- First-aid facilities

Lab Requirements

- N/A

Student Facilities

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal Storage lockers

Instructor's Office Space

- Desk and filing space
- Computer tools and equipment

Tools and Equipment

Shop (Facility) Tools

Standard Tools

- Adjustable wrench
- Aligning bar (sleever bar)
- Allen key set
- Bar clamps
- Beam clamps
- Bolt bag
- Bolt cutters
- Cable cutters
- Centre punch
- Chalk line
- Chipping hammer
- Cold chisel
- Combination square
- Combination wrench set
- Drill bits
- Files
- Finger clamps
- Flashlight
- Hack saw
- Hammers
- Hickey bar
- Knocker wrench
- Marlin spike
- Needle nose pliers
- Nut drivers
- Pins (drift, bull)
- Pipe cutters
- Pipe wrench
- Pliers
- Pry bar
- Punch
- Reamers
- Rod bag
- Scrapers
- Screwdrivers
- Side/diagonal cutters
- Sledge hammer
- Slip joint pliers
- Socket set
- Spud wrench
- Tap set
- Tin snips
- Tool belt
- Tool bucket
- Wire brush

Measuring and Layout Tools

- Bevel squares
- Builders level
- Chalk line
- Laser level
- Laser square
- Measuring chain
- Measuring tape
- Micrometers
- Optical levels
- Piano wire
- Plumb line
- Prism
- Rod level
- Scale
- Spirit levels
- Squares (framing, combination)
- Straight edges
- String line
- Theodolite
- Torpedo level
- Transit
- Tripods
- Vernier
- Water level

Power Tools

- Air chisel
- Band saw
- Chop saw
- Mag drill
- Peening tool
- Pencil grinder

- Circular saw
- Compressor
- Electric hacksaw
- Gas cut-off saw
- Generator
- Grinder
- Hammer drill
- Hydraulic jacks (and accessories)
- Impact gun

Safety Equipment

- Air movers (fans)
- Cables
- Eye wash facilities
- Fire blankets
- Fire extinguishers
- First aid equipment
- Fume and toxic gas detector
- Guard rails

Personal Protective Equipment

- Beamer
- Dog leash
- Double lanyard
- Ear plugs
- Face shields
- Full body harness
- Gloves
- Goggles
- Respirators
- Retractable lanyard

Specialty Tools (Welding and Cutting Tools)

- Arc air (gouger)
- Arc welding machine
- Cutting tools (oxygen, acetylene)
- Propane

- Percussion drill
- Porta band
- PT jack and pump
- Powder actuated tool
- Power drill
- Reciprocating saw
- Rivet buster
- Riveting gun
- Tension control gun

- Life lines
- Perimeter cables
- Portable lighting
- Ropes (fibre, wire)
- Signage
- Stanchion posts
- Warning tape
- Welding flash screens

- Rope grabs
- Rubber gloves
- Safety glasses
- Safety vest
- Welding apron
- Welding gloves
- Welding helmet
- Welding jacket
- Welding shield

- Plasma cutter
- Stud welding equipment
- Tiger torch

Student Equipment (supplied by school)

Required

- Tool box
- Adjustable wrench
- Chipping hammer
- Wire brush
- Tip cleaner
- Tri square
- Pliers
- Centre punch
- Cold chisel
- Hammer
- Tape measure

Student Tools (supplied by student)

Required

- Hard hat
- Steel toe boots
- Reinforcing tool belt
- Structural tool belt

Reference Materials

Required Reference Materials

- Steel Erection Level 1
- Reinforced Concrete Level 1
- Ontario Rigging Manual

Recommended Resources

- WorkSafeBC - <http://www2.worksafebc.com>

Suggested Texts

- IPT's Crane and Rigging Training Manual
- IPT's Guide to Blueprint Interpretation
- IPT's Metal Trades and Welding Manual

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:

- Ironworker (Generalist) – Certificate of Qualification from BC, preferably with an Interprovincial Red Seal endorsement, *or*
- Ironworker (Generalist) – Certificate of Qualification from another Canadian jurisdiction with an Interprovincial Red Seal endorsement

Work Experience

- A minimum of 5 years experience working in the industry as a journeyperson.

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Instructors Diploma or equivalent
- Bachelor's Degree in Education