SKILLEDTRADESBC

PROGRAM OUTLINE

Ironworker (Reinforcing)

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SKILLED TRADES BC

IRONWORKER (REINFORCING)

PROGRAM OUTLINE

APPROVED BY INDUSTRY

MAY 2012

BASED ON

NOA 2010

Developed by
SkilledTradesBC
Province of British Columbia

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Section 1

INTRODUCTION

Ironworker (Reinforcing)

Foreword

A Program Outline is a SkilledTradesBC Program Standards communication tool. It reflects the full scope of knowledge and skills required to competently perform an occupation anywhere in B.C.

The Program Outline must guide development of curriculum and learning resources because all SkilledTradesBC assessment tools are designed to measure achievement of the competencies and learning tasks it describes for an occupation (e.g., level exams, certification exams, practical assessments).

The Program Outline informs industry, training providers, instructors, the public, apprentices, and sponsors of the occupation's requirements for certification, including:

- The program Credentialing Model
- General Areas of Competence (GACs) and specific competencies required by individuals to perform proficiently in this occupation
- Learning tasks and content that must be mastered in order for an individual to be deemed competent
- Achievement Criteria for demonstrating practical competencies

It further informs technical training delivery regarding:

- Levels at which competence mastery is required
- Suggested time allocation for each topic
- Facility requirements
- Required tools and equipment
- Reference materials
- Instructor qualifications
- Assessment guidelines

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 performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

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

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by the Construction Industry Training Organization (CITO).

Industry Subject Matter Experts retained to assist in the development of Program Outline content:

- Neil Basaraba
- Lucien Cloutier
- Neil Corley
- Ray Donison
- Maurice Lavallee
- Alphonse Lavallee
- Kirk Linardis
- Mike McKoryk
- Andrew Reid
- Ron Rollins

Industry Subject Matter Experts retained as outline reviewers:

- Mike McKoryk

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Ironworker (Reinforcing) 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, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels
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	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Appendix – Glossary of Acronyms			Defines program specific acronyms	

Section 2

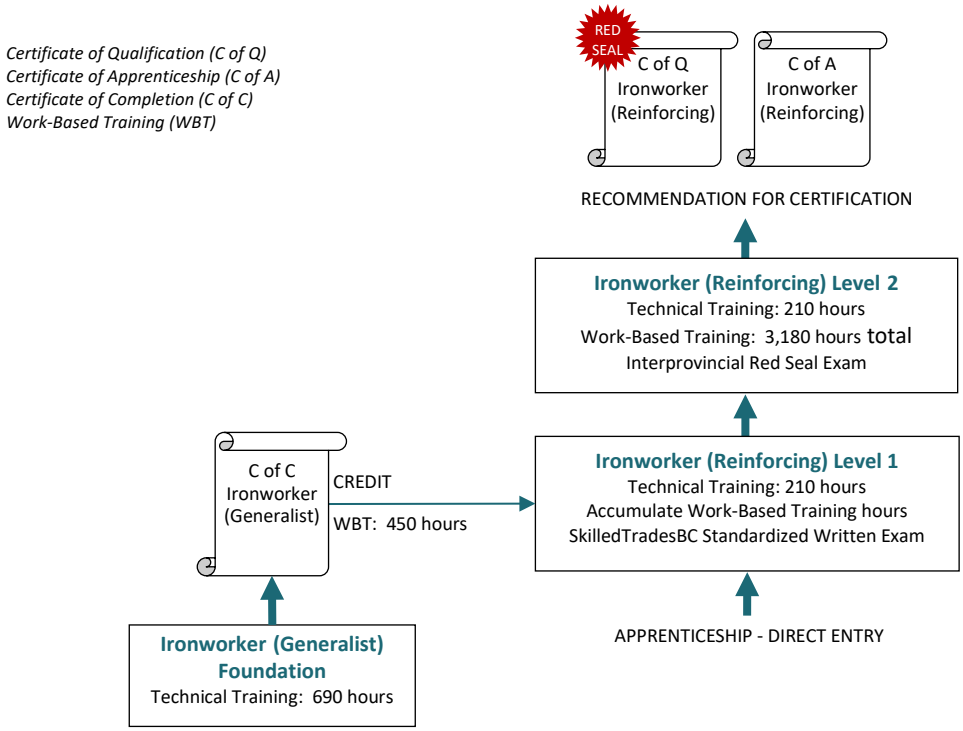
PROGRAM OVERVIEW

Ironworker (Reinforcing)

Program Credentialing Model

Apprenticeship Pathway

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



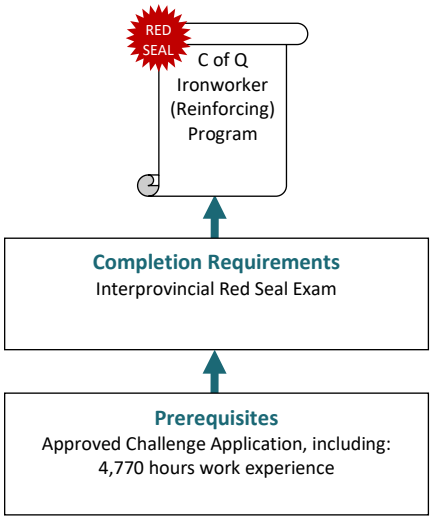
CREDIT FOR PRIOR LEARNING

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

None

Challenge Pathway

This graphic provides an overview of the Ironworker (Reinforcing) challenge pathway.



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 (REINFORCING)

Occupation Description: Ironworker (Reinforcing) means a person who places and secures rebar in formwork. They work on foundations, walls, slabs and may prefabricate columns and zones. They also carry, cut, sort and site bend rebar and other materials used in reinforcing various concrete structures.

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					
USE TOOLS AND EQUIPMENT **B**	Use Hand Tools B1 1	Use Measurement and Layout Tools B2 1, 2	Use Power Tools B3 1	Use Welding and Cutting Tools B4 1, 2	Use Ladders and Platforms B5 1	Use Concrete Connecting and Anchoring Tools and Equipment B6 1
ORGANIZE WORK **C**	Use Mathematics C1 1, 2	Interpret Drawings and Specifications C2 1, 2	Communicate with Others C3 1	Handle Materials C4 1		

Program Overview

USE RIGGING, HOISTING AND LIFTING EQUIPMENT **D**	Use Ropes and Slings D1	Use Rigging and Hoisting Equipment D2	Use Mechanical Lifting Equipment D3	Apply Procedures for Heavy Rigging and Marine Rigging D4	
	1 2	1 2	1	2	
APPLY CRANE WORK PROCEDURES **E**	Apply Lifting Practices for Cranes E1	Assemble and Disassemble Cranes E2			
	1	2			
APPLY REINFORCING TECHNIQUES **F**	Apply Principles of Reinforcing Concrete F1	Install and Fabricate Reinforcing Material F2			
	1 2	1 2			
APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES **G**	Apply Principles of Pre-Stressed Systems G1	Place Un-bonded Post-Tensioning Systems G2	Place Bonded Post-Tensioning Systems G3		
	1	1 2	1 2		

Training Topics and Suggested Time Allocation

Ironworker (Reinforcing) – Level 1

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**USE SAFE WORK PRACTICES**	**10%**	**60%**	**40%**	**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		✓		
Line B	**USE TOOLS AND EQUIPMENT**	**15%**	**60%**	**40%**	**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	Use Concrete Connecting and Anchoring Tools and Equipment		✓	✓	
Line C	**ORGANIZE WORK**	**10%**	**100%**	**0%**	**100%**
C1	Use Mathematics		✓		
C2	Interpret Drawings and Specifications		✓		
C3	Communicate with Others		✓		
C4	Handle Materials		✓		
Line D	**USE RIGGING, HOISTING AND LIFTING EQUIPMENT**	**15%**	**50%**	**50%**	**100%**
D1	Use Ropes and Slings		✓	✓	
D2	Use Rigging and Hoisting Equipment		✓	✓	
D3	Use Mechanical Lifting Equipment		✓		
Line E	**APPLY CRANE WORK PROCEDURES**	**10%**	**50%**	**50%**	**100%**
E1	Apply Lifting Practices for Cranes		✓	✓	
Line F	**APPLY REINFORCING TECHNIQUES**	**25%**	**50%**	**50%**	**100%**
F1	Apply Principles of Reinforcing Concrete		✓	✓	
F2	Install and Fabricate Reinforcing Material		✓	✓	
Line G	**APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES**	**15%**	**50%**	**50%**	**100%**
G1	Apply Principles of Pre-Stressed Systems		✓	✓	
G2	Place Un-bonded Post-Tensioning Systems		✓	✓	
G3	Place Bonded Post-Tensioning Systems		✓		
	Total Percentage for Ironworker (Reinforcing)Level 1	**100%**			

Training Topics and Suggested Time Allocation

Ironworker (Reinforcing) – Level 2

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line B	**USE TOOLS AND EQUIPMENT**	**15%**	**50%**	**50%**	**100%**
B2	Use Measurement and Layout Tools		✓	✓	
B4	Use Welding and Cutting Tools			✓	
Line C	**ORGANIZE WORK**	**15%**	**100%**	**0%**	**100%**
C1	Use Mathematics		✓		
C2	Interpret Drawings and Specifications		✓		
Line D	**USE RIGGING, HOISTING AND LIFTING EQUIPMENT**	**20%**	**50%**	**50%**	**100%**
D1	Use Ropes and Slings		✓	✓	
D2	Use Rigging and Hoisting Equipment		✓	✓	
D4	Apply Procedures for Heavy Rigging and Marine Rigging		✓	✓	
Line E	**APPLY CRANE WORK PROCEDURES**	**15%**	**50%**	**50%**	**100%**
E1	Apply Lifting Practices for Cranes		✓		
E2	Assemble and Disassemble Cranes		✓		
Line F	**APPLY REINFORCING TECHNIQUES**	**25%**	**50%**	**50%**	**100%**
F1	Apply Principles of Reinforcing Concrete		✓	✓	
F2	Install and Fabricate Reinforcing Material		✓	✓	
Line G	**APPLY PRE-STRESSING/POST-TENSIONING TECHNIQUES**	**10%**	**50%**	**50%**	**100%**
G2	Place Un-bonded Post-Tensioning Systems		✓	✓	
G3	Place Bonded Post-Tensioning Systems		✓	✓	
	Total Percentage for Ironworker (Reinforcing)Level 2	**100%**			

Section 3

PROGRAM CONTENT

Ironworker (Reinforcing)

Level 1

Ironworker (Reinforcing)

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 Reinforcing 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
  - Clothing
  - Hair and beards
  - Jewellery
- Housekeeping
- Clear head-impairment
- Horseplay
- Respect for others' safety
  - Workplace conduct
  - Workplace violence
- Constant awareness of surroundings

LEARNING TASKS	CONTENT

	• Safe attitude
	• Management of hazards
	• Noise
	• Environmental
	  ○ Water
	  ○ Wildlife
	  ○ Sunstroke
	  ○ Fatigue
	  ○ Dehydration
	• Shot-crete
	• Grout

2. Describe long term hazards in the Ironworker Reinforcing trade	• Respiratory disease • Asbestos • Silica • Noise • Repetitive strain injuries • Management of hazards
3. Describe safety precautions when working at elevations	• Wind • Floor openings • Guard rails • Safety lines • Weather • Stressed cables • Access and egress • Emergency evacuation ○ On site evacuation box
4. Demonstrate emergency procedures	• Emergency shutoffs • Fire control systems • Eye wash facilities • Emergency exits • Emergency contact/phone numbers • Outside meeting place • Disaster meeting place
5. Describe non-emergency injury reporting procedures	• First aid facilities • Reports

LEARNING TASKS	CONTENT

6. Describe and interpret worksite safety policies	• 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
	• 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 the parts of the Occupational Health and Safety Regulations applicable to the Ironworker workplace.
- Interpret the parts of the Occupational Health and Safety Regulations applicable to the Ironworker workplace.

LEARNING TASKS	CONTENT
1. Locate terms used in the Workers Compensation Act	• Definitions, Section 1 of the Act
2. Locate the conditions under which compensation will be paid (Book 1)	• Part 1, Division 2 of the Act
3. Locate the general duties of employers, employees and others (Book 1)	• Part 2, Division 3, Sections 115-124 of the Act
4. Locate the Workers Compensation Act requirements for the reporting of accidents (Book 1)	• Part 1, Division 5, Section 53 and 54 of the Act

5. Locate the "Core Requirements" of the Occupational Health and Safety Regulation (Book 1)	• Definitions
	• Application
	• Rights and responsibilities
	  ○ Health and safety programs
	  ○ Investigations and reports
	  ○ Workplace inspections
	  ○ Right to refuse work
	• General conditions
	  ○ 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 (Book 2)	• 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 • Mobile equipment • Transportation of workers • Traffic control • Electrical safety • Post tensioning
7.	Interpret Occupational Health and Safety information that is relevant to the Ironworker trade	• 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 a confined space procedure.

LEARNING TASKS	CONTENT

1. Describe a confined space	• Section 9 of OHS
	• Responsibilities of worker and employer
	• Procedures
	  ○ Access/egress
	  ○ Hole watch
	  ○ Air quality testing
	  ○ Lock out and isolation
	  ○ Ventilation
	  ○ Cleaning/purging/venting/inserting
	  ○ Rescue procedures
	• Entry permits

2. Identify equipment used when working in a confined space	• Respirators • Ladders • Tripod • Harness • Air tester
3. Use equipment and procedures in a confined space scenario	• 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

1. Describe fall protection equipment	• Fall arrest/restraint/work positioning equipment
	  ○ Harness
	  ○ Waist belts/D-ring belt with belly hook
	  ○ Hardware
	  - Beamer
	  - Lanyard
	  - Carabiner
	  - Shock-absorbing devices
	  - Retractable devices
	  - Vertical line grab (fiber and wire)
	  - Cable/nylon tie-off slings
	  - Work positioning
	  ○ Standards (CSA)
	• Inspection and maintenance
	• Worksite awareness
	• OHS Regulations Part 11

2. Describe fall protection systems	• Railings/scaffolds • Nets • Hardware • Anchor points • Assembly • Ladder systems • Vertical and horizontal systems

3. Demonstrate proper use of fall protection equipment and systems	• OHS Regulations Part 11
	• Daily inspection
	• Assembly/disassembly
	• Fall protection plan
	  ○ Identify work area and risks
	  ○ List and choose equipment
	  ○ Rescue procedures
	• Fit test

Achievement Criteria

Performance	The learner will perform a fit test.
Conditions	The learner will be given: • A harness and a D-ring belt with a belly hook
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • D-ring position (between shoulders) • Snugness of fit

Line (GAC): A USE SAFE WORK PRACTICES

Competency: A5 Use Personal Protective Equipment

Objectives

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

- Select and use personal protective equipment.

LEARNING TASKS	CONTENT
1. Describe personal protective equipment requirements	• Safety footwear • Eye protection • Ear protection • Head protection • Gloves • Hi visibility vests • Respiratory protection • Fit test for respirator • Clothing ○ Chaps • Fall protection • Hydrogen sulphide gas monitors
2. Use personal protective equipment	• Use • Inspection • Maintenance • Storage

Achievement Criteria

Performance	The learner will perform a fit test for a respirator.
Conditions	The learner will be given: • A respirator
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Snugness of fit • Timing: 30 seconds or less • Accuracy

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
1. Describe the conditions necessary to support a fire	• Air • Fuel • Heat
2. Describe the classes of fires according to the materials being burned	• Class A • Class B • Class C • Class D • Symbols and colours

3. Apply preventative fire safety precautions when working near, handling or storing flammable liquids or gases, combustible materials and electrical apparatus	• Fuels
	  ○ Diesel
	  ○ Gasoline
	  ○ Propane
	  ○ Natural gas
	  ○ Acetylene
	• Ventilation
	  ○ Purging
	• Lubricants
	• Oily rags
	• Combustible metals
	• Aerosols

4. Describe the consideration and steps to be taken prior to fighting a fire	• Warning others and fire department • Evacuation of others • Fire contained and not spreading • Personal method of egress • Training

5. Apply the procedure for using a fire extinguisher	• Extinguisher selection
	• P.A.S.S.
	  ○ Pull
	  ○ Aim
	  ○ Squeeze
	  ○ Sweep

Line (GAC): A USE SAFE WORK PRACTICES

Competency: A7 Attain First Aid Certification

Objectives

To be competent in this area, the individual must:

- Attain First Aid Certification.

LEARNING TASKS	CONTENT
1. Attain First Aid Certification	• Arrange training with a certified provider of First Aid Certification

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 hand tools.
- Inspect and maintain tools.

LEARNING TASKS	CONTENT

1. Describe and select hand tools	• Tool belt
	  ○ Holster
	  ○ Adjustable wrench
	  ○ Saw wrench
	  ○ Bolt bag
	  ○ Hammers
	  ○ Pliers
	  ○ Snips/side cutters
	  ○ Tie wire reel
	• Task-specific tools
	  ○ Tirfors/come-alongs
	  ○ Hickey bar
	  ○ Snipe
	  ○ Torque wrench
	  ○ Pry bars
	  ○ Sockets
	  ○ Pipe wrench
	  ○ Sledge hammer
	  ○ Wedges
	  ○ Spinners
	  ○ Hilti/epoxy gun
	• Post-tensioning tools
	  ○ Screw driver
	  ○ Wedge-setting tools
	  ○ Sheath cutter
	  ○ Pocket former remover
	  ○ Staple gun (pneumatic and manual)
	  ○ Knife

2. Use hand tools	• Purposes/uses • Procedures/operations • Safety • Adjustment

3. Inspect and maintain hand tools	• Inspection • Maintenance • Storage • As per job requirement and manufacturer 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 measurement and layout tools.

LEARNING TASKS	CONTENT
1. Describe and select measurement and layout tools	• Tape measure • Marking device • Squares • Levels ○ Laser, magnetic and manual • Chalk line • Straight edge • Scribe and soapstone • Plumb bob • String/piano wire
2. Use measurement and layout tools	• Purposes/uses • Proper use • Procedures/operations • Set-up • Safe use and storage • Adjustment
3. Inspect and maintain measurement and layout tools	• Inspection • Maintenance

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B3 Use Power Tools

Objectives

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

- Select power tools.
- Use power tools.
- Inspect and maintain power tools.

LEARNING TASKS	CONTENT

1. Select power tools	• Rebar placing
	  ○ Cut-off saws
	  ○ Electric band saw
	  ○ Electric/hydraulic cutter
	  ○ Hand-held hydraulic bender
	  ○ Journeyman bender
	  ○ Table top bender
	  ○ Tie gun
	  ○ Impact guns
	  ○ Hammer drills
	  ○ Heavy duty compressors
	  ○ Grinder
	  ○ Generator
	• Post-tensioning placing
	  ○ Pneumatic staple gun
	  ○ Stressing jacks/pump
	  ○ Compressor
	  ○ Grout machine
	  ○ Cable cutter
	  ○ Hydraulic pocket cutter
	  ○ Grinder
	  ○ Plasma cutter
	  ○ Hand drills

2. Use power tools	• Types • Parts • Purpose/uses • Procedures/order of operations • Safe use • Adjustment • Inspection • Maintenance • Storage

- Assured grounding

3. Inspect and maintain power tools

- As per job requirement and manufacturer specifications

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 how to operate and maintain a cut off saw.
- Use a cut off saw to cut mesh.
- Cut using oxy-acetylene tools.

LEARNING TASKS	CONTENT

1. Describe how to operate and maintain a cut off saw	• Filling with mixed fuel
	• Starting procedure
	• Changing blades
	  ○ Difference between blades
	  ○ Proper blade with proper rpm rating
	• Basic maintenance
	• Storage and care of blades and saw

2. Use a cut off saw to cut rebar, PT cable and mesh	• Safety
	  ○ Fire hazard
	  ○ Cutting hazard
	  ○ Spark
	  ○ Kick-back
	• Bar elevation
	• Cutting at heights
	• Blade angle
	• Fuel storage and refueling location

3. Describe plasma cutting	• Purpose/uses • Limitations • Equipment • Materials to be cut • Consumables • Safety • Procedures/operations • Set-up • Adjustment • Take down • Inspection • Maintenance • Storage

4. Describe oxy-acetylene cutting	• Purposes/uses
	• Limitations
	• Equipment
	  ○ Torch head
	  ○ Rose bud
	  ○ Combination torch
	  ○ Standard hand torch
	  ○ Lance
	  ○ Striker
	  ○ Tip cleaner
	• Materials to be cut
	• Consumables
	• Safety
	• Procedures/operations
	• Set-up
	• Adjustment (working pressures and flame types)
	• Take down
	• Inspection
	• Maintenance
	• Storage/handling

5. Use cutting tools	• Oxy-acetylene
	• Procedures for operating
	  ○ Full set-up and breakdown
	  ○ Maintenance and storage
	  ○ Cut bar
	  ○ Cut mesh

Achievement Criteria #1

Performance — The learner will set up a torch from start to finish, cut a bar to required length and break down the torch for storage.

Conditions — The learner will be given:

- Tools
- Equipment
- Instructions

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

- Safety Procedures
  - Protection of hose
  - Fire extinguisher readiness
  - Control zone (when at heights)
- Proper sequence
- Hose repair, clamp replacement
- Operational readiness
- Proper length
- Proper shutdown

Achievement Criteria #2

Performance — The learner will use a cut off saw to cut rebar.

Conditions — The learner will be given:

- Tools
- Equipment
- Materials
- Instructions

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

- Identification and use of mixed fuel
- Safety procedures when using the cut off saw
- PPE
- Awareness of surroundings
- Spark control

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	CONTENT

1. Describe ladders and elevated platforms	• Types
	  ○ Scaffolds
	  - Mechanical, rolling, stationary, ladder jack
	  ○ Aerial work platforms
	  ○ Aluminum and wooden planks
	  ○ Extension ladders
	  ○ Swing stages
	  ○ Step ladders
	  ○ Angel wings
	  ○ Bridge brackets
	  ○ Man basket
	• Uses
	• Safety
	  ○ Hazard recognition
	  ○ OHS

2. Use ladders and elevated platforms	• Selection • Set up • Moving ladders • Limitations • Securing • Inspection • Maintenance • Storage

3. Use access equipment	• Aerial lifts (certification required; employer responsibility)
	  ○ Boom and scissor
	  - Gas powered and electrical

Achievement Criteria

Performance	The learner will demonstrate proper use of ladders and planks/platforms.
Conditions	The learner will be given: • Ladder and planks/platforms • Instructions

Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria:
	• Proper set up
	  ○ Angle ratio
	  ○ Tie off
	• General safety precautions

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B6 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	CONTENT

1. Describe connecting and anchoring tools/equipment and their uses in concrete	• 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
	  ○ Mask (concrete dust)
	• Limitations
	• Inspection
	• Maintenance
	• Storage
	• Selection for job requirements
	• Equipment used with connectors and fasteners
	• Application

2. Describe concrete anchors	• Area
	• Selection of anchor
	• Selection of drill and bit
	• Self-driller
	• Pre-drilled
	  ○ Epoxy
	  ○ Wedge
	• Grout

3.	Describe procedures for drilling concrete	• Preparation
		• Communication with other trades
		  ○ Specifically plumbing and electrical
		• Location of PT and ducts
		• Layout
		• Drilling in concrete and block walls
		  ○ Rebar contact
		  ○ Spalling
		  ○ Concrete edge distance
		  ○ Depth of hole
		  ○ Starting the hole
		• Cleaning
		  ○ Wire brushing/pump
		• Drills
		  ○ Hammer
		  ○ Drill and carbide bit
		  ○ Core

4.	Use a hammer drill to drill vertically or horizontally into concrete	• Safety • Tool orientation • Rebar contact

Achievement Criteria

Performance: The learner will drill a hole to a specific depth in concrete.

Conditions: The learner will be given:

- Equipment
- Material
- Instructions

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

- According to requirements
- Control of the drill/accuracy
- Safety consideration
- Cleaning and preparation
- Placing of epoxy in the hole
- Installation of dowel

Line (GAC): C ORGANIZE WORK

Competency: C1 Use Mathematics

Objectives

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

- Apply mathematical principles to solve problems.

LEARNING TASKS	CONTENT
1. Use fractions to solve problems	• Add, subtract, multiply, divide • Express in higher terms • Simplify fractions
2. Use decimal fractions to solve problems	• Add, subtract, multiply, divide • Convert between decimals and fractions • Decimal notation
3. Solve problems of ratio and proportion	• Ratio ○ Equivalent • Proportion • Unknown quantities • Similar triangles

4. Use metric and imperial measurements	• Convert between metric and imperial
	  ○ Feet, inches/meters, millimeters
	  ○ Pounds, tons/kilograms, tonnes
	• Use conversion tables

5. Solve geometric problems	• Area
	• Perimeter
	• Volume
	• Angles
	• Arc
	• Radius and diameter
	• Formulas for area of:
	  ○ Square and rectangles
	  ○ Triangles
	  ○ Parallelogram
	  ○ Trapezoid
	  ○ Circle
	  ○ Sector
	  ○ Segment
	  ○ Other relevant geometric shapes

6. Solve problems using trigonometry	• Pythagorean theorem • Sine • Cosine • Tangent

Line (GAC): C ORGANIZE WORK

Competency: C2 Interpret Drawings and Specifications

Objectives

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

- Describe types of drawings used in Ironwork.
- Interpret drawings for reinforcing, bar placing and post-tension application.
- Identify views on a shop drawing.

LEARNING TASKS	CONTENT

1. Describe types of drawings used in Ironwork	• Hierarchy of drawings
	• Architectural
	• Structural
	  ○ Placing/detail sheet
	  ○ Fabrication
	  ○ Post-tensioning
	• Civil
	• Mechanical
	• Procedural

2. Interpret drawings for reinforcing, bar placing and post-tension application	• Basic format
	  ○ Legends
	  ○ Lines
	  ○ Symbols
	  ○ General notes
	  ○ Abbreviations
	  ○ Material list
	  ○ Scale
	  ○ Direction marks and placement marks
	  ○ Centres and work points
	  ○ Grid lines
	  ○ Details
	  ○ Title block
	  ○ Legend
	• Stressing end anchorages
	• Anchorages
	• Support systems
	• Tendon symbols
	• Drape profile
	• Anchor zone reinforcing
	• Detail/cut sheets

3. Identify views on drawings

- Orthographic projections
- Pictoral
- Isometric
- Oblique
- Plan
- Elevation
- Sections

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	CONTENT

1. Describe methods of communication	• Listening
	• Verbal
	• Written
	• Drawings
	• Trade terminology
	• Use of:
	  ○ Two-way radios
	  - Etiquette
	  ○ Fax machines
	  ○ Computers
	• Interpersonal skills
	• Ethics/moral responsibility
	• Signage
	  ○ Men working above
	  ○ Tapes (yellow, red)

2. Communicate with others	• Other trades • Industry people • Apprentices (mentoring)

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.
- Describe the proper procedures for handling materials.
- Handle materials according to job requirements.

LEARNING TASKS	CONTENT

1. Describe considerations and responsibilities when handling, ordering and coordinating materials	• Safety/OHS
	• Ergonomics
	• Storage
	• Timing
	• Transportation
	  ○ Method of transportation
	• Off-loading
	  ○ Crane type
	  ○ Excavator machine
	  ○ Fork lift
	  ○ Zoom boom
	• LEED (Leadership in Energy and Environmental Design)
	• Labelling
	  ○ MSDS
	• Moving
	• Product protection
	• Disposal
	• Recycling
	• Identification of materials

2. Describe procedures for handling materials	• Safety • Procedures • Securing • Packaging/shipping • Pallets • Barrels • Cages • Containers
3. Handle materials according to job requirements	• According to job requirements • Safety procedures

- Shipping and storage considerations

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:

- Describe slings and hitches.
- Describe fibre and wire rope.
- Tie knots, bends and hitches.
- Use slings, hitches and bends for rigging.
- Use rope for hand lines and load control.

LEARNING TASKS	CONTENT
1. Describe slings and hitches	• Two-eye wire slings • Vertical • Baskets • Choker hitches • Bridle hitches • Endless slings • Tension and safe working loads according to configuration • Eye configuration and efficiency • Inspection, storage, handling, maintenance, safety considerations • Unequal leg length
2. Describe synthetic slings	• Inspection, storage, maintenance, uses, safety considerations
3. Describe fibre rope (natural and synthetic)	• Construction and lays • Uses • Methods and types of splicing • Properties of fibre ropes • Selection for use • Inspection, storage, handling, maintenance, safety considerations • Identify working load limits
4. Describe wire ropes	• Properties and uses • Characteristics • Lays and cores • Selection • Methods and types of splicing • Inspection, storage, handling, maintenance,

		safety considerations
5.	Describe and select ropes and slings based on strength, properties, wear resistance and known configuration	• Fatigue • Abrasion • Corrosion • Bending • Crushing • Rotation • Weight • Specifications grade • Elasticity • Durability • Gross capacity

6.	Describe purpose and application of knots use in rigging and hoisting	• Knots
		  ○ Bowline
		  - Standard running
		  ○ Clove hitch
		  ○ Reef knot
		  ○ Sheet bend
		  ○ Figure eight
		  - Single
		  - Double
		• Barrel
		• Rolling hitch
		• Snubber
		• Harness hitch

7	Tie knots, bends and hitches	• Knots
		  ○ Bowline
		  - Standard running
		  ○ Clove hitch
		  ○ Reef knot
		  ○ Sheet bend
		  ○ Figure eight
		  - Single
		  - Double
		  ○ Barrel
		  ○ Rolling hitch
		  ○ Snubber
		  ○ Harness hitch
		• Rope types
		• Calculate working load limits
		• Terms

		• General rules • Knot, bend and hitch types • Inspection
8.	Describe chain rigging	• Inspection, maintenance, use, storage • Identify working load limits
9.	Use rope for hand lines and load control	• According to job specifications • Safety
10.	Use slings, hitches and bends for rigging	• Inspection, storage, handling and maintenance • Safety

Achievement Criteria

Performance	The learner will tie a 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 finish

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.
- Use hoisting and rigging equipment.

LEARNING TASKS	CONTENT

1. Describe hoisting and rigging equipment	• Types
	  ○ Hoisting equipment
	  ○ Rigging equipment
	• Uses
	• Limitations and capacities
	• Government regulations
	• Safety

2. Describe rigging hardware components appropriate for the task	• Hooks • Headache balls • Swivels • Blocks • Sheaves • Shackles • Clips • Thimbles • Eyebolts • Load binders • Spreader bars • Equalizer bars and plates • Turnbuckles • Drums • Chains • Softeners • Sway braces • Muffler clamps

- Spines/stiffener
  - Alumibeam
  - 4 x 6
  - 35, 45, 55 mm bars
  - 2 x 4 on walls
- Welded lifting equipment

3. Identify auxiliary hoisting equipment

- Types of hoists and derricks
  - Fixed boom
  - Stiff-leg derrick
  - A-frame
  - Material hoisting lifts
  - Personnel hoisting lifts
  - Fork lifts
- Types and applications of hoists and tuggers
- Tugger winches
- Hand winches
- Chain hoists and come-a-longs
- Cable pulleys/tirfor

4. Use hoisting and rigging equipment

- Calculation of weight
- Selection of equipment
- Selection of lifting location or point
- Pre-fabricated columns, beams and walls
- Anchorage and hold back
- Mechanical advantage
- Safety
- Operating procedures
- Communication and hand signals
- Securing of loads
- Inspection
- Maintenance
- Storage

Achievement Criteria

Performance	The learner will calculate mass, choose the appropriate size rigging and hardware, position the rigging on the load and ensure the crane is at an appropriate radius to pick and place the load.
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: • Accuracy in mass calculation • Use of minimum size rigging • Selection of appropriate hardware • Control of load • Appropriate crane positioning

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

Competency: D3 Use Mechanical Lifting Equipment

Objectives

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

- Describe different types of jacks.
- Describe uses for jacks.
- Describe how to move a load using jacks and rollers.
- Use jacks.

LEARNING TASKS	CONTENT

1. Describe jacks	• Types
	  ○ Plain screw
	  ○ Differential screw
	  ○ Hydraulic
	  ○ Pneumatic
	  ○ Screw gear and ratchet
	  ○ Ratchet-track
	  ○ Wedge and screw
	  ○ Screw and toggle
	  ○ Strand jack
	  ○ Mono-strand jack

2. Describe uses for jacks	• Lifting
	• Knowledge of mass and distribution of weight (centre of gravity)
	• Removals
	• Positioning
	  ○ Blocking and cribbing
	• Providing clearance
	• Compressing or spreading bars
	• Safety
	  ○ Load limits
	  ○ Ergonomics
	  ○ Position of jack and personnel/crush
	  ○ Ground stability
	  ○ Travel distance/stroke
	  ○ Accuracy
	  ○ Required number
	  ○ Position
	  ○ Controls
	  ○ Gauges
	• Storage and handling
	• Maintenance

3. Describe how to move a load using jacks and rollers	• Procedures • Location/positioning of jacks/rollers • Holdback considerations • Base conditions ○ Decline/incline • Size, type and number of jacks/rollers depending on load • Weight considerations • Rigging considerations • Blocking • Centre of gravity • Safety • Communication • Maintenance • Storage • Handling

4. Use jacks	• According to job requirements
	• Selection and use of jacks for:
	  ○ Lifting
	  ○ Pulling
	  ○ Tensioning
	  ○ Stressing

Line (GAC): E APPLY CRANE WORK PROCEDURES

Competency: E1 Apply Lifting Practices for Cranes

Objectives

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

- Describe and identify different types of cranes.
- Identify the effects of differing crane radiuses.
- Use communication procedures for moving and hoisting.
- Describe safe crane setup and operation.
- Set-up a crane.

LEARNING TASKS	CONTENT

1. Describe different types of cranes	• Types
	  ○ Boom truck
	  ○ Carry deck
	  ○ Crawler/conventional
	  ○ Tower crane (fixed and self-erecting)
	  ○ Mobile hydraulic boom
	  ○ Gantry
	  ○ Heavy lift cranes
	  ○ Rough terrain
	  ○ Overhead crane

2. Describe and identify the effects of differing crane radiuses	• Effects of change in radius on capacity based on crane charts • Boom deflection • Headroom • Differing crane radiuses and differing crane types

3. Use communication procedures for moving and hoisting	• Hand signals
	  ○ Methods and precautions
	  ○ Tower, conventional, crawler, and hydraulic crane
	  - One handed and two handed
	• Non-visual communication
	  ○ Voice, radio, intercom, horn

4.	Describe safe crane set-up and operation	• Set-up
		  ○ Level crane
		  ○ Ground conditions
		  ○ Fully extended outriggers
		  ○ Tires off the ground
		• Overloading
		• Power lines/overhead hazards
		• Swing hazards
		• Underground hazards
		• Weather hazards
		• Other cranes
		  ○ Communication between operators

5.	Set-up a crane	• According to instructions

Achievement Criteria

Performance	The learner will demonstrate control of a crane using visual and non-visual forms of communication.
Conditions	The learner will be given: • Materials • Equipment • Task instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Adherence to a checklist of tasks and procedures

Line (GAC): F APPLY REINFORCING TECHNIQUES

Competency: F1 Apply the 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 on reinforcing steel.
- Describe the principles of reinforced concrete.
- Describe and identify reinforced steel mill-rolled markings.

LEARNING TASKS	CONTENT
1. Describe the principles of concrete	• Properties • Advantages and disadvantages of concrete structures • Hardening, cure time, MPa value

2. Describe the forces on concrete	• General forces on concrete – live and dead loads (dynamic loads and static load)
	• Specific forces on concrete
	  ○ Compression
	  ○ Tension
	  ○ Shear
	  - Vertical shear
	  - Horizontal shear
	  - Punching shear

3. Describe where the forces on concrete are manifested in structures	• Beams
	• Columns
	• Footings
	• Slabs
	• Walls
	  ○ Shear walls
	  ○ Retaining walls
	• Cantilevers
	• Zones
	• Abutment
	• Pile caps

4.	Describe the properties of reinforcing systems	• Grade strength and diameter (metric and imperial)
		• Types
		  ○ Weldable
		  ○ Non-weldable
		  ○ High strength-threaded
		  ○ Stainless
		  ○ Carbon/glass fibre bar
		  ○ Welded wire mesh-designation
		  ○ Smooth bar
		  ○ Deformed bar
		  ○ Pre-stressing steel
		• Coatings
		  ○ Galvanized
		  ○ Epoxy coated
		• Shape and placement of steel

5.	Describe the principles of reinforced concrete	• Bonding of concrete to steel • Location and shape of steel • Purpose of concrete coverage • Tolerances
6.	Describe and identify reinforced steel mill-rolled markings	• Manufacturer's mark • Size • Grade-number or line system • Weldable

Achievement Criteria

Performance	The learner will identify the location of stress loads and the location of required reinforcing on a diagram of a typical concrete structure.
Conditions	The learner will be given: • Diagram of concrete structures
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Correct location of stress loads and required reinforcing

Line (GAC): F APPLY REINFORCING TECHNIQUES

Competency: F2 Install and Fabricate Reinforcing Material

Objectives

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

- Install reinforcing material.

LEARNING TASKS	CONTENT

1. Identify proper reinforcing material	• Size, grade, length, shape and location for required tasks
	• Types of material
	• Supplier identification markings
	  ○ Tags
	  ○ Colour codes denoting length and location
	• Shipping list (bar list)
	• Detail sheets and placing drawings

2. Place reinforcing material	• Safety
	  ○ PPE
	• Proper lifting and handling
	• Installation methods
	  ○ Built-in-place
	  ○ Pre-assembled
	  ○ Pre-fabricated
	• Layout
	  ○ Measure and mark and cut
	  - Pre-fabrication
	  - Columns and beams
	  - Slabs
	  - Footings
	  - Walls
	  - Stud rails
	  - Shear stud
	  ○ Frame up and placing order
	  - Support and bracing
	  - Types of support
	  - Chairs, bolsters, etc.
	  - Tying back/tying off
	  - Guy wires
	• Install balance of steel

3. Tie reinforcing material

- Types of wire
  - Gauges
  - Coatings
  - Stainless
- Types of ties
  - Figure 8
  - Snap tie
  - Saddle tie
  - Nail tie
  - Doubles
  - Wraps
- Purposes/selection of ties
- Tying specifications and percentages
- Tying sequence
- Tools and equipment

Achievement Criteria

Performance	The learner will place steel according to instructions.
Conditions	The learner will be given: • Instructions • Materials • Tools
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Accuracy within parameters • Required number of bars and shapes in proper location • Proper interpretation of the information that is provided by the instructor • Quality of installation • Timelines

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

Competency: G1 Apply Principles of Pre-Stressed Systems

Objectives

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

- Describe pre-stressed systems for manufacturing pre-cast members.
- Describe placement of strands and accessories.
- Apply the principles of pre-stressed systems to a given task.

LEARNING TASKS	CONTENT

1. Describe pre-stressed systems	• Purpose and advantages
	• Principles
	  ○ Effects of rebar and cable on structure
	  ○ Tolerances according to specifications
	• Applications
	  ○ Floor systems
	  ○ Girders
	  ○ Columns

2. Describe stressing bed, strands and accessories	• Stressing bed
	  ○ Forms
	  - Self-stressing
	  - Fixed abutment
	• Strand
	  ○ Bare/uncoated
	  ○ High-strength
	  ○ Sizes
	  ○ Configuration/profile of the strand
	  ○ Embedment
	• Independent strands
	• Accessories
	  ○ Bell anchor
	  ○ Wedges
	  ○ Hold down

3. Layout the profile	• Types of pre-stressed/post-tensioning systems
	  ○ Bonded
	  ○ Un-bonded
	  ○ Cable
	• Materials
	  ○ Strand
	  ○ Bar
	  ○ Anchors
	• Installation practices
	• Placement tolerances of ductwork and supports
	• Benchmarks and elevations
	• Imperial and metric measurements
	• Layout duct and tendon positions

4. Place tendons and accessories	• Safety
	• Procedures for placing tendons
	  ○ Installation practices
	  ○ Sequence
	  ○ Positioning and securing of tendons and accessories
	• Use of tendon support system
	• Tolerances
	• Operation of winching equipment
	• Repair/replacement of damaged ducts and tendons

5. Install bursting steel and anchorages

- Types of bursting steel
- Anchorages
  - Single strand
  - Multi strand
  - Bell
  - Shim
  - Lock nut
  - Anchor zone reinforcing
  - Anchor recess and pocket clearances
- Components
  - Blocks
  - Wedges
  - Anchors
  - Coils
- Steel and anchorage installation procedures and placing tolerances
- Procedures for placing, modifying and tying bursting steel
- Rebar tying methods
- Installation of anchorages

6. Connect tendons to anchors

- Types of anchors
  - Barrel
  - Cable
- Types of tendons
- Tendon and anchor connection procedures
- Fastening techniques
- Anchor installation
- Securing wedges

7. Protect exposed tendons

- Tendon protection materials
  - Duct tape
  - Heat shrink
  - Grease/caulking
- Protection techniques
  - Selection of protection materials
- Potential contaminants
- Fault identification and correction
- Installation of tendon protection

Achievement Criteria

Performance	The learner will run a cable through a pre-fabricated cage.
Conditions	The learner will be given: • Instructions • Materials • Tools
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Proper installation • Elongation and gauge pressure to specification

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

Competency: G2 Place Un-Bonded Post-Tensioning Systems

Objectives

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

- Describe un-bonded post-tensioning systems.
- Install an un-bonded tendon to specifications.

LEARNING TASKS	CONTENT

1. Describe un-bonded post-tensioning systems	• Strand
	  ○ Coated
	  - Grease and sheath
	  ○ High-strength
	  ○ Sizes
	  ○ Configuration/profile of the strand
	  ○ Anchorage systems
	• Accessories
	  ○ Anchors
	  ○ Wedges
	  ○ Pocket formers
	  ○ Nails, screws, staples
	  ○ Chairs/bolster
	• Purpose and advantages
	  ○ Creation of longer span without support
	  ○ Reduction of required material
	  ○ Increased number of floors and space per floor
	  ○ Lighter structures
	• Principles
	  ○ Effects of rebar and cable on structure
	  ○ Tolerances according to specifications
	  ○ Movement
	• Applications

2. Describe placing tendons	• Safety
	• Handling and rigging techniques
	  ○ Use of slings (basket formation)
	  ○ Storage
	  - Off ground
	  - Tarped
	  ○ Methods of identification
	  - Colour codes or tags

- Coordination
  - Utility locations
  - Shear stud/embedded plate locations
  - Punching shear mat
- Sequence of work
  - Layout-measure and mark
    - As per location and height
  - Install anchor and pocket formers at live end
  - Install bursting steel
  - Roll out tendons
    - Hand
    - Turntable use
  - Securing dead ends
  - Chairing
    - Secure chair
    - Secure tendons to chair
    - Groups or singular
    - Types of ties
- Connect (stab) tendons to anchorage
- Check profile
- General awareness and reporting of any damage

3. Describe preparation of tendons for stressing

- Strip bulkhead
- Inspect for concrete deficiencies
  - Ensure MPa (third party)
- Remove pocket formers
- Check anchor for squareness and location
- Cut and remove sheathing
- Inspect sheathing and tendon
- Install grippers and wedges
  - Seating tool
- Clean the tendon/remove grease
- Paint a benchmark

4. Describe stressing tendons

- Safety
  - Tie off jack
  - Identify and tape off live areas (along length of cable)
- Prepare/inspect/clean equipment
  - Stressing jack/inspection of wedges
  - Pump
  - Gauges
    - Calibration
  - Hoses

- Identification of sequence
- Ensure benchmark
- Install jack and stress to required pressure
- Check elongation
- Approval of results

5. Describe cutting and capping tendons

- Safety
- Cutting methods
  - Torch (awareness)
  - Pocket shear
  - Grinder
  - Plasma cutter
- Clean pocket
- Cap

Achievement Criteria

Performance	The learner will layout and install an un-bonded tendon to specifications.
Conditions	The learner will be given: • Instructions • Materials • Tools
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Accuracy • Dead end location • Profile accuracy • Straightness of tendon

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

Competency: G3 Place Bonded Post-Tensioning Systems

Objectives

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

- Describe bonded post-tensioning systems.

LEARNING TASKS

1. Describe bonded post-tensioning systems (strand and bar)

CONTENT

- Strand
  - Uncoated
  - High-strength
  - Sizes
  - Configuration/profile of the strand
  - Anchorage systems
  - Single or multi-strands
- Accessories
  - Anchors
    - Multi-strand anchor systems
    - Wedges
  - Duct/pipe (steel or plastic)
  - Pocket former
  - Nails, screws, staples
  - Chairs/bolster
  - Trumpets
  - Bearing plate/bell
- Purpose and advantages
  - Creation of longer span without support
  - Reduction of required material
  - Increased number of floors and space per floor
  - Lighter structures
  - Protection
    - Insulated from heat, abrasion, vibration
- Principles
  - Effects of rebar and cable on structure
  - Tolerances according to specifications
  - Movement
- Applications
- Bar

- Uncoated/coated
  - Stainless steel
  - Galvanized
  - Epoxy coated
- High strength
- Sizes
- Anchorage systems

- Accessories
  - Anchors
  - Duct/pipe (steel or plastic)
  - Anchor/pocket former
  - Cap
  - Trumpets/air vent
  - Bearing plate
  - Plate
  - Coupler
  - Nut
- Purpose and advantage of bar
  - Creation of longer span without support (temporary)
  - Draw out excess slack
  - Reduction of required material
  - Increased number of floors and space per floor
  - Lighter structures
  - Protection
    - Insulated from heat, abrasion, vibration
  - Erection of segmented bridges
  - Durability
  - Anchorage
    - Soil
  - Rock

2. Describe placing tendons

- Safety
- Handling and rigging techniques
  - Use of slings (basket formation)
  - Storage (dryness is critical)
    - Off ground
    - Tarped
  - Methods of identification
    - Colour codes or tags

- Coordination
  - Utility locations

  - Shear stud/inbed locations
  - Punching shear mat
- Sequence of work
  - Layout-measure and mark
    - As per location and height
  - Install anchor and pocket formers at live end
  - Install and bursting steel/spiral
  - Duct, support and chairing
    - Secure duct to supports
    - Duct splicing/sealing requirements
    - Rubber coupler with clamp
    - Install air vents at required location
  - Feed tendons
    - Hand/manual
    - Winch/hydraulic pusher
    - Fish line/air
  - Securing dead ends
- Check profile
- General awareness and reporting of any damage

Level 2

Ironworker (Reinforcing)

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	CONTENT
1. Use levelling equipment to verify the accuracy of layout provided	• Laser level • Remaining within clearance tolerances • Proper setup and placement of level

Achievement Criteria

Performance	The learner will set-up a laser level.
Conditions	The learner will be given: • Laser level • Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Accuracy (within clearance tolerance) • Position

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:

- Use oxyacetylene equipment.
- Use welding equipment.
- Identify welding joints.
- Recognize welding defects.

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content
2. Use oxyacetylene equipment	• Safety • Equipment ○ Standard hand torch • Materials • Consumables • Procedure operations • Set-up • Adjustment • Maintenance • Inspection • Storage and handling

3. Use welding equipment	• Welding symbols
	• Standards
	  ○ CWB
	  ○ CSA
	  ○ ASTM
	  ○ AWS
	• Welding hazards
	  ○ Fumes/air quality
	  ○ Optical-ultraviolet light
	  ○ Electrical shock
	  ○ Overhead
	  ○ Burns
	  ○ Sparks/fire
	  ○ Environmental
	• Welding equipment
	  ○ PPE
	  ○ Types of welders

- Welding processes
  - Stick weld (SMAW)
  - Wire (FCAW)
  - Basic electricity/AC-DC
  - Resistance
  - Polarity
  - Duty cycle
  - Heat effect
  - Pre-heat/post-heat
- Set-up welding equipment
  - Polarity
  - Identify power source
  - Connectors and clamps
  - Identify controls
  - Identify cable sizes
  - Identify consumables and their functions

4. Identify welding joints
   - As per application
5. Recognize welding defects
   - Cracking
   - Inclusion
   - Porosity
   - Lack of fusion

Achievement Criteria #1

Performance	The learner will demonstrate the proper use of a hose repair kit.
Conditions	The learner will be given: • Tools • Equipment • Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Fault identification • Hose repair/replacement • Proper fittings • Lines cut even • Check for leaks

Achievement Criteria #2

Performance	The learner will set-up a portable welder and perform a lap weld on reinforcing steel.
Conditions	The learner will be given: • Tools • Equipment • Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Proper set-up • Visual inspection of final weld

Line (GAC): C ORGANIZE WORK

Competency: C1 Use Mathematics

Objectives

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

- Apply mathematical principles to solve problems related to the daily tasks of an ironworker.

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content
2. Solve problems of ration and proportion	• Working bevel • Metric and imperial
3. Apply mathematical principles to daily projects	• Calculations of: o Height - Determination of sufficient headroom for lifting o Volume and capacity - Volume and capacity of vessels that contain ironwork-related products and consumables o Angles - With a given working bevel for a stair, determine the bisect cut angle for a common wall rail o Arc - Determine chord lengths between two points in a given arc o Mass - Determine the mass of various material - Determine angles with two given sides and determine a side with a given angle and a given side
4. Solve multi-step problems using mathematical concepts as learned in Levels 1 and 2	• Word and diagram problems o Material weights o Triangulation of cranes o Below-the-hook rigging triangles o Capacity

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 shop drawings.
- Identify schedules from a structural engineering drawing.
- Identify reinforcing requirements based on reinforcing steel drawings.
- Identify the types of post-tensioning as shown on drawings.
- Identify the post-tensioning anchorage needs as shown on drawings.
- Identify the types of post-tensioning concrete construction from structural engineering and post-tension drawings.
- Identify and compile the post-tensioning requirements from a structural drawing.

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content
2. Interpret shop drawings	• Notes • Abbreviations • Sections • As per project specifications
3. Identify welding symbols	• As per project specifications
4. Identify schedules from a structural engineering drawing	• Footings • Columns and zones • Beams and joists • Slabs • Cross headers and lintels • Note: Bar placing order

5.	Identify reinforcing requirements based on reinforcing steel drawings	• Foundations and footings • Walls, columns and capitals • One and two-way slabs • Beams and slabs • Beam and joists and waffle slabs • Bridge decks, piers and abutments • Tanks and silos • Pre-case members • Reinforcing steel placing • Q-decking reinforcing • SKS/RFI • CDs/change of directives • Engineered support • Engineered crane
6.	Identify the types of post-tensioning as shown on drawings	• Bonded • Un-bonded • Bar • Pre-stressed concrete
7.	Identify the post-tensioning anchorage needs as shown on drawings	• Pocket clearance • Anchor recess • Anchor zone reinforcing • Types of anchorage • Double live ends
8.	Identify the types of post-tensioning concrete construction from structural engineering and post-tension drawings	• Slabs • Beams • Beams and joists • Bridge girders • Silos, tanks, and slab on grade
9.	Identify and compile the post-tensioning requirements from structural drawings	• Tendon cutting list from a post-tension placing drawing • A stressing data sheet from the tendons from a post-tensioning drawing • Calculate elongations and stressing lengths from post-tensioning drawings

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
1. Review Level 1	• As per Level 1 content
2. Use fibre and wire ropes, slings and hitches according to configurations and appropriate formulas	• Vertical/multiple leg • Baskets/D-to-D ratio • Choker hitches/angle of choke • Bridle hitches/multiple leg bridles • Wire rope slings-sliders • Endless slings (care/capacity determination/location of tag during use) • Synthetic web slings (considerations and dangers using flat web slings at angles, tag consideration) • Tension and safe working loads according to multiple configurations • Eye configuration and efficiency • Inspection and storage • Compare charts, given formula and safe working recall values
3. Use natural and synthetic fibre ropes	• Selection for use based on properties and conditions • Storage, handling, maintenance • Splices and knots

Achievement Criteria #1

Performance	The learner will tie 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 • Demonstrate knot according to suggested scenario • Determine appropriate knot for the task

Achievement Criteria #2

Performance	The learner will perform wire rope inspection and create a written inspection report.
Conditions	The learner will be given: • Materials • Equipment • Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Accuracy of written inspection report against master report

Achievement Criteria #3

Performance	The learner will apply minimum size choker(s) required for a given task.
Conditions	The learner will be given: • Materials • Equipment • Instructions
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Configuration • Mass • Physical condition

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.
- Calculate a reeve system.
- Select equipment based on transfer of load.

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content

2. Describe rigging hardware	• Drums
	  ○ Drums/fleet angle
	  ○ Installation of rope on grooved and plain drums
	  ○ Transfer of line drum-to-drum
	• Blocks
	  ○ Snatch blocks
	  ○ Reeved blocks/multi-sheaved
	  - Procedure for multi-sheaved reeve-up-right angle or lacing
	  ○ Heavy blocks
	  ○ Traveling blocks/standing blocks
	  ○ Parts and sheave size and type (roller or bearing)
	  ○ Mechanical advantage
	  ○ Compound frictions
	  ○ Angle ratios

3. Select and use hoisting and rigging equipment	• Calculation of weight • Selection of equipment ○ Transfer of load • Selection of lifting location or point • Anchorage and hold back • Mechanical advantage/reeve up • Safety • Operating procedures • Communication and hand signals • Securing of loads • Inspection • Maintenance • Storage
4. Calculate a reeve system	• Mechanical advantage

	• According to power source • According to line size • Determination of length of line ○ Above and below grade • Anchorage and holdbacks • Safety

5. Select equipment based on transfer of load	• Transfer of loads
	  ○ 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

6. Calculate and select highline equipment based on the loads	• Calculation of capacity • Calculation of weight • Calculation of high line tensions • Load holdback • Securing of loads • Incline plane • Anchorage and holdbacks • Safety

Achievement Criteria

Performance	The learner will design and install a multi-part wire rope reeve system with a clipped-eye becket for a given task.
Conditions	The learner will be given: • Instructions • Task objective • Variety of available equipment
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Block position • Proper alignment of routing • Starting and finishing point • Installation of becket • 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

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

Competency: D4 Apply Procedures for Heavy Rigging and Marine Rigging

Objectives

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

- Identify marine hoisting equipment.
- Identify heavy lift rigging.
- Describe barge loading and unloading.
- Discuss procedures for heavy rigging and marine rigging.
- Identify safety practices for heavy rigging and marine rigging.
- Identify and analyse heavy lift rigging.
- Analyse a dual lift rigging plan.

LEARNING TASKS	CONTENT
1. Identify marine hoisting equipment	• Floating derricks • Crane barges • Spud barges • Slew winches • Tide lifts • Tide book • Crane charts based on barge configuration

2. Identify heavy lift rigging	• Tuggers and winches
	• J hooks
	• Counter balanced lifts
	• Rolling beams
	  ○ Track/tailing dollies
	• Jacking and rolling heavy objects
	• Spreader bars/equalizer bars
	• Shackles
	  ○ Blocks

3. Describe barge loading and unloading	• Dockside
	• Ramps
	  ○ Permanent
	  ○ Temporary
	• Shoreline oceans
	• Rivers
	• Load types
	• Load placement
	• Balance of load

		○ Ballasting • Safety ○ Communication
4.	Identify safety practices for heavy rigging and marine rigging	• Regulations ○ Life jackets • Adherence to engineered plan • Awareness of surroundings ○ Cables, winch lines • Site-specific considerations
5.	Discuss procedures for heavy rigging and marine rigging	• According to job requirements
6.	Describe heavy lift rigging	• Counter balanced lifts-dual lifts ○ Centre of gravity ○ Base conditions ○ Cribbing, blocking and jacking plate ○ Jacking frames • Communication ○ Operator and crew
7.	Analyse the heavy rigging plan	• Safety/procedures • Components • Configurations • Capacities • Tolerance • Specifications • Order of communication
8.	Analyse a dual lift rigging plan	• Length and weight of object • Centre of gravity of object • Capacity of cranes • Position of cranes • Position of crane attachment to object • Rigging attachments • Balanced/level lowering • Procedure • Safety • Communication • Adherence to engineering plan

Achievement Criteria

Performance — The learner will analyse a dual lift rigging plan.

Conditions — The learner will be given:

- A complete dual lift rigging plan

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

- Size of equipment
- Location of equipment
- Unloading point
- Required rigging
- Required mats and cribbing
- Amount of counter weight
- Transfer of load
- Swing direction
- Required number of boom angle changes
- Placement location
- Headroom
- Order of communication

Line (GAC): E APPLY CRANE WORK PROCEDURES

Competency: E1 Apply Lifting Practices for Cranes

Objectives

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

- Determine crane position.
- Prepare base for crane set-up.

LEARNING TASKS	CONTENT
1. Review site hazards	• As per Level 1 content
2. Determine crane position	• Knowledge of crane capacity • Ability to calculate crane radius • Ability to read crane charts • Knowledge of maximum weight of lift • Knowledge of combined weight of rigging components • Calculate available headroom • Knowledge of crane quadrants • Knowledge of required set-up space and swing radius
3. Prepare base for crane set-up	• Knowledge of gross weight of crane • Knowledge of composition of base such as soil, concrete and steel • Ability to select pads such as mats, dunnage and cribbing • Ability to visually assess ground conditions • Ability to ensure ground is stable • Ability to install falsework

Line (GAC): E APPLY CRANE WORK PROCEDURES

Competency: E2 Assemble and Disassemble Cranes

Objectives

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

- Identify hazards associated with assembling/disassembling cranes.
- Describe types of crane parts.
- Describe crane assembly/disassembly.
- Describe moving cranes on site.
- Set-up a crane and install jib.

LEARNING TASKS	CONTENT

1. Identify site hazards	• Types of hazards
	  ○ Power lines
	  ○ Underground services
	  ○ Obstructions to swing radius
	  - Other cranes in the area
	  ○ Uneven ground
	  ○ Lock outriggers (if crane has them)

2. Describe types of crane parts	• Pads • Outriggers • Frame • Turntable • Counterweight • House/cab • Drums and gantries • Boom stops • Boom types and sections • Jibs-straight and luffing • Main line • Whip line • Levelling jacks • Load block/headache ball • Mast holdbacks and guylines • Trolley • Pennant lines • Pins • Sheave • Self-erecting mast frames • Tracks • Extendable axles

3.	Describe crane assembly	• Sequence of assembly • Signals • Required tools and equipment • Blocks and dunnage • Rigging procedures • Installation of components ○ Jib installation • Reeve/lace blocks • Engineered lifts • Finalize the set-up
4.	Set-up crane and install job	• According to instructions
5.	Describe moving cranes on site	• Pre-planning crane location and route • Hazard recognition • Procedures • Base conditions • Communication
6.	Describe crane disassembly	• Hazards recognition • Methods and sequence of disassembly • Required tools and equipment • Rigging procedures • Disconnect components ○ Jib stowage • Communicate with crane operator • Rig components • Block boom sections

Line (GAC): F APPLY REINFORCING TECHNIQUES

Competency: F1 Apply Principles of Reinforcing Concrete

Objectives

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

- Describe reinforcing codes and standards.
- Select the appropriate material for a given task based on the principles and standards of reinforced concrete.

LEARNING TASKS	CONTENT
1. Review Level 1	

2. Describe reinforcing codes and standards	• According to Level 1 content
	• Principles
	  ○ Bending tolerances
	  - Tail length
	  - Pin diameters
	  - Common bend degrees
	  ○ Standard shapes
	• Clearance minimum codes
	  ○ Bar supports
	• CSA standards
	• CRSI standards
	• Splices
	  ○ Types
	  - Mechanical
	  - Lapped-side-by-side and staggered
	  - Embedment and projection
	  - Welded
	  - Terminator Bar/Plate
	  ○ Classes
	  - Tension
	  - Compression
	  - Tension and compression

3. Select the appropriate material for a given task based on the principles and standards of reinforced concrete	• According to job specification and industry standards

Achievement Criteria

Performance	The learner will select the proper size of steel and identify the pin diameter and side and tail length based on the required task.
Conditions	The learner will be given: • Legend • Materials • Bender
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Proper dimensions • Proper pin diameter

Line (GAC): F APPLY REINFORCING TECHNIQUES

Competency: F2 Install and Fabricate Reinforcing Material

Objectives

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

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

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content
2. Fabricate and install rebar from a structural drawing or similar source	• 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 and fabricate a column based on information on a drawing.
Conditions	The learner will be given: • Instructions • Materials • Equipment
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Proper cover • Accuracy • Projection • Quality of tying • Quality of stirrups • Overall appearance • Timelines

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

Competency: G2 Place Un-Bonded Post-Tensioning Systems

Objectives

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

- Interpret specification standards.
- Describe reasons for de-stressing.
- Analyse a drawing and determine specifications.

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content

2. Interpret specification standards	• Hierarchy
	  ○ PTI
	  ○ Engineering (job specific)
	  ○ Supplier
	• Fanning out dead ends and live ends
	• Spacing standards
	• Bursting steel requirements
	• Double-live ends
	• Identify intermediate anchorages

3. Describe reasons and procedures for de-stressing (for new construction)	• Blowout in concrete
	• Procedures
	  ○ Identify potential hazards
	  ○ Restrict work zone access
	  ○ Ensure engineered shoring is in place
	  ○ Follow engineering procedures

4. Describe de-stressing requirements	• Equipment
	  ○ Jack
	  ○ Pump
	  ○ Gauges
	  ○ Hoses
	  ○ De-stressing chair
	  ○ Needle nose pliers
	• Procedures
	  ○ Chair
	  ○ Jack
	  ○ Awareness of ram length
	  ○ Stroking variation (pressure)

Achievement Criteria

Performance	The learner will analyse a drawing and determine specifications as required.
Conditions	The learner will be given: • Instruction • Materials
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Find specification • Accuracy of finding

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

Competency: G3 Place Bonded Post-Tensioning Systems

Objectives

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

- Describe preparation of tendons for stressing.
- Describe stressing tendons.
- Describe cutting and capping tendons.
- Describe grouting.
- Identify and select bonded post-tensioning components as required, and their purpose.

LEARNING TASKS	CONTENT
1. Review Level 1	• As per Level 1 content

2. Describe preparation of tendons for stressing	• Strip bulkhead
	• Inspect for concrete deficiencies
	  ○ Ensure MPa (third party)
	• Remove recessed pocket formers
	• Check anchor for squareness and location
	• Ensure air/grout vents have not been damaged
	• Inspect sheathing and tendon
	• Install wedge plate
	• Install grippers and wedges
	  ○ Seating tool
	• Protect excess tail

3. Describe stressing tendons	• Safety
	  ○ Tie off jack
	  ○ Identify and tape off line areas (along length of cable)
	• Prepare/inspect/clean equipment
	  ○ Clean the tendon
	  ○ Stressing jack/inspection of wedges
	  ○ Pump
	  ○ Gauges
	  - Calibration
	  ○ Hoses
	• Identification of sequence
	• Ensure benchmark
	  ○ Remove slack, then establish benchmark
	• Install jack and stress to required pressure and elongation

		• Approval of results

4.	Describe cutting and capping tendons	• Safety
		• Cutting methods
		  ○ Torch (awareness/approval)
		  ○ Pocket shear
		  ○ Abrasive disk
		  ○ Plasma cutter
		• Clean pocket
		• Cap

5.	Describe grouting	• Purpose
		• Makeup/composition
		  ○ Mixed or pre-mixed
		  ○ Specification
		• Testing
		  ○ Air
		• Pumping

6.	Identify and select bonded post-tensioning components	• As per job requirements

Achievement Criteria

Performance	The learner will identify and select bonded post-tensioning components as required, and describe their purpose.
Conditions	The learner will be given: • Instructions • Materials
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: • Correct terminology • Selection of correct component • Correct explanation of the purpose of the component

Section 4

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- Comfortable seating and tables suitable for learning
- Compliance with the local and national fire code and occupational safety requirements
- Overhead and multimedia projectors (digital or computerized) 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/internet (one computer per instructor; one computer per two students)
- Trade-related reference material for student and instructor use

Shop Area

- 10,000 square feet including:
  - Indoor area for workshop and storage
  - Outdoor area with cover storage
  - Outdoor area for crane and large equipment/material
  - Ceiling height sufficient to allow safe movement of material
  - Adequate lighting and lighting control
  - Ventilation as per WorkSafeBC standards
  - Refuse and recycling bins for used shop materials
- Access required for:
  - Tool crib large enough to contain all necessary supplies
  - Appropriate storage for gases and fuels/bottles
  - First-aid facilities, as per WorkSafeBC requirements

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

Shop Equipment

Required

- Mobile and/or tower crane
- Journeyman/table top rebar bender
- Portable welder/generator
- Rigging equipment (wire rope slings, shackles, chain bridles, synthetic slings, equalizers and spreaders, snatch blocks, wedge anchors, tirfors, come-a-longs)
- Oxy/fuel cutting equipment (cylinders, hoses, regulators and torches)
- Ladders
- Scaffold
- Compressor
- First aid equipment
- Eyewash
- Fire blankets
- Pre-fab horses
- Slab horses
- Lazy Susan

Recommended Consumable Materials

- Standard rebar diameters (10,15, 20, 25M) in sufficient quantity to complete practical requirements of the outline
- Prestressing steel in sufficient quantity to complete practical requirements of the outline

Shop (Facility) Tools

Standard Tools

- Gas powered cut off saw
- Port-a-power and attachments
- Impact wrench
- Power drill (cord and cordless)
- Builders level/theodolite
- Grinder/zip cut

Specialty Tools

- Post-tensioning strand jack, gauges, pump, hoses
- De-tensioning equipment (nose piece, stool, etc.)
- Hand seating tools
- Chair stapler (air/slide)
- Hickey bars

Recommended

- Plasma torch
- Pocket shear
- Portable hydraulic/electric bender
- Portable hydraulic/electric shear

Student Equipment (supplied by school)

Required

- Face shields
- Welding and burning shields/glasses
- Flame resistant burning/welding jackets
- Spirit levels (torpedo, two foot, etc.)
- Wrenches/screwdrivers
- Tip cleaner
- Chipping hammer
- Wire brush
- Dust masks
- Hearing protection
- Eye protection
- Retractable lanyards
- Lifelines (horizontal, static, vertical, etc.)
- Tin snips
- Personal fall protection/work positioning gear
- Lanyards
- Needle nose pliers
- Chalk lines

Student Tools (supplied by student)

Required

- Leather work gloves
- Puncture/flame resistant clothing (ie. Carharts, canvas, denim or other suitable material)
- Hi-visibility vest/shirt
- 25’ combination metric and imperial tape measure
- Toolbelt (bolt bag, pliers and sidecutters with holster, tie wire reel, marking crayon)
- CSA approved hard toed boots
- CSA approved hardhat
- Pocket knife

Recommended

- Integrated fall protection/work positioning harness/toolbelt

Reference Materials

Required Reference Materials

- Concrete reinforcing Level 1 (BCIT)
- IPT's crane and rigging handbook (IPT)

Recommended Resources

- Worksafebc.com
- Skillplan.ca

Suggested Texts

- RSIC manual of standard practice
- CSAO rigging manual
- CSAO crane manual
- Welder Level C P2 oxy gas fuel cutting

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:

- SkilledTradesBC Certificate of Qualification in Ironworker (Reinforcing) preferably with a Red Seal Endorsement
- Certificate of Qualification in Ironworker (Reinforcing) from another Canadian jurisdiction complete with 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:

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