

Ironworker (Generalist) Level 1

Ironworker (Generalist)

Unit: A1 Learning About Work

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign that an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill. The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and industrial/construction deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the JP's knowledge and experience. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act, regulations, Provincial Advisory Committees and the National/Provincial Occupational Analysis from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honored foundation of Trades journeywork.

Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe structure and scope of the Ironworker trade.	n/a
a. The Apprenticeship and Certification Act	
• Apprenticeship and Certification Board and Provincial Advisory Committees	
• General and specific trade regulation	
• Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training provider)	
b. Uses of the (National Occupational Analysis (NOA)	
• Technical training in-school curriculum	
• On-the-job record book of hours (Manitoba blue book)	
• Examinations (level placement tests, final certification examinations)	
c. Opportunities and future career options	

- Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.
- Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of leadership between management and shop floor workers.
- Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the drawbacks to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

2. Describe two levels of workplace competency.

n/a

- a. Job competencies related to workplace culture
 - Knowledge of workplace equipment and materials
 - Skills and techniques
- b. Social competencies related to workplace culture
 - Frame of reference for evaluation workplace events
 - Language of work
 - Workplace belief systems
 - Rules and meanings
 - Multiculturalism and equity in the workplace

3. Describe accommodation for apprentices with disabilities.

n/a

- a. Technical training
 - Requirements
 - Roles and responsibilities
 - Services and information required by persons with disabilities
- b. On-the-job
 - Requirements
 - Roles and responsibilities
 - Services and information required by persons with disabilities

Ironworker (Generalist)

Unit: A2 Trade Safety Awareness

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of trade apprenticeship training both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about trade safety hazards and precautions presented in the appropriate contexts of discussion and study. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.**

Objectives and Content:

Percent of Unit Mark (%)

1. Identify safety and health requirements.

n/a

- a. Overview of The Workplace Safety and Health Act ("the Act")
 - Rights and responsibilities of employees under the Act
 - Rights and responsibilities of employers under the Act
 - Rights and responsibilities of supervisors under the Act
- b. Fourteen (14) regulations
- c. Codes of practice
- d. Guidelines
- e. Right to refuse
 - Explanation of right to refuse process
 - Rights and responsibilities of employees
 - Rights and responsibilities of employers
 - Rights and responsibilities of supervisors under the Act

2. Identify personal protective equipment (PPE) and procedures.

n/a

- a. Employer and employee responsibilities as related to personal protective equipment.
- b. Standards: Canadian Standards Association (CSA), American National Standards Institute (ANSI) and guidelines
- c. Work protective clothing and danger if it fits poorly.
- d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)

- e. Headwear – appropriate protective headwear when required and the approved type of headwear.
 - f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
 - g. Foot protection – when required according to safety standards
 - h. Hearing protection
 - Hazards of various noise levels (hearing protection must be worn)
 - Laws
 - Types of hearing protection
 - i. Respiratory protection – types, overview of proper selection
 - j. Fall protection – Manitoba requirements standards guidelines
 - ANSI (U.S.A. standards), etc.
 - k. Ladders and scaffolding
 - l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)
- 3. Identify electrical safety. n/a**
- a. Effects of electric current on the human body
 - b. Three factors that affect the severity of an electric shock
 - c. The effects of arc and blast on the human body and equipment
 - d. Work with energized equipment
- 4. Identify fire safety. n/a**
- a. Types of fires
 - b. Types of fire fighting equipment
 - c. Classifications of fire extinguishers (A, B and C)
 - d. Location of fire extinguishers and fire exits
 - e. Fire alarms and drills
- 5. Identify ergonomics. n/a**
- a. Definition of ergonomics and conditions that may affect the body
 - Working postures
 - Repetition
 - Force
 - Lifting (simple safety procedures and precautions related to material handling procedures on how to lift carry and put down a load)
 - Tools
 - Identify tool and safety equipment
 - Causes of hand tool accidents
 - Equipment
- 6. Hazard recognition and control. n/a**
- a. Safe work practices
 - b. Basic risk assessment
 - c. Injury prevention and control measures
 - d. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them
- 7. Hazard of confined space entry: n/a**

- a. Identification of a confined space
- b. Hazards of a confined space
 - Physical
 - Biological
- c. Working in a confined space
- d. Emergency response plan
- e. Self contained breathing apparatus (SCBA)

8. Identify First Aid/CPR: n/a

- a. Overview of First Aid Regulation
- b. Obligations of employers regarding First Aid
 - Who is certified to provide First Aid?
 - What to do while waiting for help?
 - Where is First Aid kit?
- c. Describe basic First Aid requirements and techniques
 - Scope and limits of First Aid intervention
 - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
 - What is it?
 - Interface with other services and agencies (eg. Workers Compensation claims)
- d. Describe basic Cardiopulmonary Resuscitation (CPR) requirements and techniques
 - How do you get certified?
 - Scope and limits of CPR intervention (include varieties of CPR certification)

9. Identify the safety requirements as they apply to WHMIS with emphasis on: n/a

- a. WHMIS is a system
- b. Provincial Regulation under The Workplace Safety and Health Act
 - Each province has a WHMIS regulation
- c. Federal Hazardous Products Act
- d. WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace
 - Information found on supplier and workplace labeling using WHMIS
 - Hazardous materials in accordance with WHMIS
 - Compliance with government safety standards and regulations
- e. Description of WHMIS (include varieties of WHMIS Certification)
 - Typology of WHMIS labels, symbols, and classifications
 - Scope and use of Materials Safety Data Sheets (MSDS)

10. Identifying and controlling hazards: n/a

- a. Basic control measures (injury prevention)
- b. Safe work procedures
- c. Explanation on the importance of industrial housekeeping
- d. Employer responsibilities
- e. How and where to store materials
- f. Safety measures related to walkways, stairs and floor openings
- g. Explanation of how to protect the worker and others when working in traffic paths

Ironworker (Generalist)

Unit: A3 Tools and Equipment

Level: One

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about hand and power tools, including procedures for their inspection, maintenance and storage. The unit also covers measurement and layout tools, and powder-actuated equipment.

Objectives and Content:	Percent of Unit Mark (%)
1. Describe hand tools used in the Ironworker trade, including procedures for their inspection, maintenance, and storage.	20%
2. Describe power tools used in the Ironworker trade, including procedures for their inspection, maintenance, and storage. a. Electric b. Hydraulic c. Gas d. Pneumatic	20%
3. Describe and demonstrate the use of measurement and layout tools. a. Identification and selection of applicable tools. b. Procedures for inspection, maintenance and storage. c. Demonstrate proficiency in the use of leveling and alignment instrument tools. d. Procedures for inspection, maintenance and storage.	25%
4. Describe and demonstrate procedure for using powder-actuated equipment.	10%
5. Describe and demonstrate the safe operation of welding equipment.	25%

Ironworker (Generalist)

Unit: A4 Access Equipment

Level: One

Duration: 21 hours

Theory: 10 hours

Practical: 11 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about access equipment, including types of ladders, scaffolding, and aerial work-platforms, and procedures for using them.

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|---|------------|
| 1. Describe and demonstrate the types of ladders, scaffolding, and aerial work-platforms used as access equipment. | 50% |
| a. Terminology | |
| b. Codes and regulations | |
| c. Special hazards and precautions | |
| d. Selection/use of fall-protection equipment | |
| 2. Describe and demonstrate specific procedures for using access equipment. | 50% |
| a. Erect, secure, and dismantle ladders. | |
| b. Erect, secure, and dismantle scaffolding. | |
| c. Inspect and maintain ladders, scaffolding, and aerial work-platform equipment | |

Ironworker (Generalist)

Unit: A5 Rigging I

Level: One

Duration: 42 hours

Theory: 28 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about hoisting, lifting and rigging terminology, equipment accessories, and related aspects. The unit then focuses on the general procedures to rig materials and equipment, including rigging calculations for hoisting and hauling operations.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hoisting, lifting and rigging.	10%
2. Identify equipment and accessories for rigging and hoisting, including their limitations and applications.	10%
3. Describe and demonstrate inspection, maintenance and storage procedures for hoisting, lifting and rigging.	10%
4. Describe and demonstrate practical applications of knots, hitches and bends.	20%
5. Perform rigging calculations for hoisting and hauling operations.	30%
a. Safe work loads	
b. Breaking strength	
c. Sling angle	
d. Tension calculations	
e. Load weight determination	
f. Centre of gravity calculations	
g. D/d ratios	
6. Describe and demonstrate procedures to safely rig materials and equipment for hoisting and hauling.	20%
a. General procedures, including:	
• Determination of load weight, load type, and weight-distribution	
• Methods of communication	
• Placement of load	
• Pre-lift and post-lift inspections	
b. Specific hazards, precautions, and safe work practices	
• Procedures to ensure work area is safe for hoisting and lifting	

- Supervision of lift
- a. Sling configuration
- b. Hardware selection
- c. Load control
- d. Safe practices
- e. Hazard identification
- f. Communication – hand signal and electronic
- g. Applicable jurisdictional codes and regulations

Ironworker (Generalist)

Unit: A6 Computer Applications

Level: One

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about basic computer knowledge and technology, including word-processing operations and use of the Internet for trade-related research.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe basic computer components and their functions.	40%
a. Areas of trade practice requiring computer technology.	
b. Methods and resources for ongoing, self-directed learning	
2. Perform basic word-processing operations.	20%
3. Describe and demonstrate Internet search skills for trade-related research.	40%
a. Use of search engines to locate trade information.	
b. Sending and receiving email.	

Ironworker (Generalist)

Unit: A7 Communication and Trade Documentation

Level: One

Duration: 7 hours

Theory: 4 hours

Practical: 3 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about effective communication, communication devices, and use and preparation of trade-related documentation.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe effective verbal and nonverbal communication.	15%
a. Other tradespersons (including hand signals)	
b. Coworkers/colleagues	
c. Supervisors	
d. Apprentices	
2. Describe and demonstrate communication devices with reference to their application and operation.	30%
a. Cellular	
b. Two-way radio	
c. Computer	
3. Describe and demonstrate trade-related documentation, including its application and procedures for work planning.	40%
a. Manufacturer specifications	
b. Codes and standards	
c. Manuals	
d. Drawings	
e. Shipping documentation	
f. Safety documentation	
4. Describe procedures used to prepare and complete trade-related documentation.	15%

Ironworker (Generalist)

Unit: A8 Welding I

Level: One

Duration: 28 hours

Theory: 14 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about terminology, hazards and precautions related to shielded-metal arc welding (SMAW). The unit then focuses on safe operation of SMAW equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with shielded-metal arc welding (SMAW).	40%
a. Terminology	
b. Interpret symbols	
2. Identify SMAW-related hazards and precautions.	20%
a. Personal	
b. Shop/facility	
c. Equipment	
d. Ventilation	
e. Storage/handling	
3. Describe and demonstrate safe operation of SMAW equipment.	40%
a. Set-up and adjustment of SMAW equipment	
b. Inspection and maintenance of SMAW equipment	
c. SMAW welding consumables, accessories	
• Electrode identification	
• Electrode selection	
d. Current and polarity selection	
e. Types of welds performed using SMAW equipment, including positions for welding	
f. Identify common weld-faults and describe procedures to prevent/correct them.	
g. Joint types and their preparation	

Ironworker (Generalist)

Unit: A9 Oxy-Fuel Cutting

Level: One

Duration: 21 hours

Theory: 10 hours

Practical: 11 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about hazards and safe work-practices and safe operation of oxy-fuel cutting and equipment. The unit then focuses on oxy-fuel cutting practices.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify hazards and safe work-practices pertaining to oxy-fuel cutting and applicable codes and regulations.	20%
a. Personal	
b. Shop/facility	
c. Equipment	
d. Ventilation	
e. Storage/handling	
2. Describe and demonstrate safe operation of oxy-fuel equipment.	40%
a. Selection of fuels and gases	
b. Set-up and shutdown procedures	
c. Flame adjustment	
• Oxidizing	
• Carburizing	
• Neutral	
d. Inspection, maintenance, transport and storage of equipment	
3. Describe and demonstrate oxy-fuel cutting practices.	40%
a. Free-hand	
• Cutting	
• Beveling	
• Piercing	
b. Track cutting (Radiograph)	
c. Identify common faults	
d. Procedure to prevent and correct common faults	

Ironworker (Generalist)

Unit: A10 Drawings I

Level: One

Duration: 28 hours

Theory: 14 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the fundamental knowledge about technical drawings, types of drawings, application of drawing projects and views to trade practice, and interpreting drawings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terms associated with technical drawings.	10%
2. Describe types of drawings and their applications.	10%
a. Civil/site/plot	
b. Architectural	
c. Mechanical	
d. Structural	
e. Shop/detail drawings	
f. Sketches	
g. Placement drawings	
3. Describe and demonstrate drawing projections and views, including their application to trade practice.	35%
a. Orthographic	
b. Oblique	
c. Isometric	
d. Section	
e. Auxiliary	
4. Describe and demonstrate drawing interpretation to obtain dimensions from drawings.	45%
a. Extract information	
• Lines	
• Legend	
• Symbols and abbreviations	
• Title block	
• Notes and specifications	
• Tolerances/allowances	
• Bill of materials	

- Schedules
 - Scales
- b. Perform calculations

Ironworker (Generalist)

Unit: A11 Cranes I: Fundamentals

Level: One

Duration: 28 hours

Theory: 21 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about crane terminology, concepts, and their types and applications. The unit then focuses on the procedures for assembling and installing crane equipment, the interpretation of related technical documents and charts, and the communication procedures related to the operation of construction cranes.

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|---|------------|
| 1. Define terminology and core concepts. | 20% |
| a. Principles of leverage | |
| b. Quadrants of operation | |
| c. Load radius | |
| d. Tipping axis | |
| 2. Identify specific crane types and their applications. | 20% |
| a. Tower crane | |
| b. Electrical overhead travelling cranes (EOTC) | |
| c. Crawler crane | |
| d. Carrier-mounted (including conventional crane) | |
| e. Rough terrain | |
| f. High capacity | |
| g. Knuckle-boom | |
| h. Derrick | |
| i. Boom truck | |
| 3. Describe and demonstrate procedure for assembling and installing crane equipment on-site. | 20% |
| a. Site hazard identification | |
| • Powerlines | |
| • Overhead powerlines | |
| • Underground utilities | |
| • Soil/ground bearing conditions | |
| b. Safe assembly procedures following manual/directive and manufacturers specifications | |
| c. Erection/assembly sequences | |

d. Supervision

4. Describe and demonstrate the interpretation of technical documents and charts. 20%

a. Information from technical drawings and specifications

- Log books
- Manuals
- Load charts
- Range diagrams
- Crane position
- Quadrants of operation

5. Describe communication procedures associated with operation of construction cranes. 20%

a. Hand signals

b. Electronic communications

c. Audible

Ironworker (Generalist)

Unit: A12 Structural Steel I

Level: One

Duration: 28 hours

Theory: 21 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about structural-steel components and related core concepts. The unit then focuses on the best practices of structural-steel erection.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the types, characteristics, preferred uses, and major shapes of structural-steel components that Ironworkers erect, fashion, and dismantle.	40%
a. Major structural steel shapes, including their designation, characteristics, and application(s) <ul style="list-style-type: none">• I-beam (standard beam)• Wide flange• Welded wide flange• Angle• Channel• Structural tee• Hollow structural shapes (HSS)• Miscellaneous shapes	
b. Primary Steel structural components and their purpose <ul style="list-style-type: none">• Columns• Girders• Beams• Trusses	
c. Secondary Steel structural components and their purpose <ul style="list-style-type: none">• Decking• Girts• Purlins• Sag rods• Bracing• Bridging• Lintels• Joists	
2. Describe structural-steel erection best practices.	60%
a. Special hazards, precautions and safe work-practices	

- b. Identification and use of relevant codes, regulations, and standards
- c. Practical use of technical drawings and project specifications
- d. Fastening techniques
 - Fasteners, structural fasteners
 - welding
- e. Layout (surveying)
- f. Plumbing and alignment
- g. False work
- h. Material handling and storage
- i. Composite construction
- j. Field fabrication
- k. Decommissioning and disassembly of structural components

Ironworker (Generalist)

Unit: A13 Reinforcing I

Level: One

Duration: 42 hours

Theory: 21 hours

Practical: 21 Hours

Overview:

This unit is designed to provide the apprentice with the knowledge about reinforcement of concrete and related concepts. The unit then focuses on the tools, procedures, and work-practices when using reinforcing steel, and the use of technical documents and related information in reinforcement-steel projects.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the rationale and the technical requirements associated with the reinforcement of concrete in modern construction-industry practice.	25%
a. General purpose and effects of reinforcing concrete, including associated technical terminology.	
b. The forces that act upon concrete structures, including:	
• Compression	
• Tension	
• Shear	
• Live/dead loads	
• Physical and mechanical bonds	
2. Identify hazards and describe safe work-practices associated with the use of reinforcing steel.	15%
a. Specific precautions (e.g. selection/use of fall-protection equipment)	
• Hoisting and rigging	
• Form work	
• Fall protection	
• Powered associated equipment	
b. Concrete Reinforcing Steel Institute (CRSI)	
3. Describe and demonstrate the use of technical documents as required in reinforcement-steel projects.	10%
a. Deriving and using relevant information about reinforcement from technical drawings and project specifications	
b. Compliance with codes and regulations:	
• Concrete Reinforcing Steel Institute (CRSI)	
• American Concrete Institute (ACI)	
c. Interpretation of standards and identification systems, including:	
• Grades and diameters	

- Mill standards
- Coloured codes and tags

4. Describe and demonstrate the tools, materials, accessories and procedures used to reinforce concrete structures. 50%

- a. Selection and use of tools and equipment for procedures, including:
- Bending
 - Cutting
 - Placing
 - Tying
 - Splicing
- b. Selection and use of reinforcing materials/accessories, including their properties, characteristics, and preferred application(s)
- Deformed bar (steel, fiberglass, composite)
 - Welded wire mesh
 - Tie-wires
 - Bar supports
 - Coupling devices
 - Shear connectors
 - Dowels
- c. Reinforcing-steel procedures and preferred practices, including:
- Site preparation
 - Selection and set-up of equipment

Ironworker (Generalist)

Unit: A14 Pre-Stressed Concrete: Fundamentals

Level: One

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the fundamental knowledge of pre-stressed concrete (pre-stressed/post-tensioning systems), and its characteristics, components and applications.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
<p>1. Define terminology associated with pre-stressed concrete.</p> <ul style="list-style-type: none"> a. Pre-tensioning and related terms b. Post-tensioning and related terms c. Bonded and unbonded systems 	10%
<p>2. Explain the purpose and effects of pre-stressed concrete structures.</p>	10%
<p>3. Describe the characteristics, components, and applications of pre-stressed concrete.</p> <ul style="list-style-type: none"> a. Types of pre-stressed concrete systems, including their defining characteristics and applications <ul style="list-style-type: none"> • Bonded (strand; wire; bar) • Unbonded (strand; wire; bar) b. Materials, components, and accessories, including their defining characteristics and applications <ul style="list-style-type: none"> • Tendons • Bursting steel • Anchorage • Conduits/ducts • Supports • Grout and grouting systems • Connectors 	40%
<p>4. Interpret codes, regulations, and other technical documents that govern pre-stressed concrete practices.</p> <ul style="list-style-type: none"> a. Special hazards and safe work practices associated with pre-stressed concrete <ul style="list-style-type: none"> • Restricted access to work zone • Structural failure • Equipment failure 	10%

- Personal protective equipment (PPE)
- b. Codes and regulations
 - Engineered products and specifications
 - Documentation/stressing records
- 5. Describe the installation procedures for pre-stressed concrete. **20%****
- a. Tools and equipment
 - Layout
 - Stressing equipment
 - Grouting equipment
- b. Safe work procedures
 - Setup
 - Operation
- c. Equipment inspection, maintenance and storage procedures
- 6. Describe the procedures for finishing tendons. **10%****
- a. Finishing tendons
 - Bonded
 - Unbonded

Ironworker (Generalist)

Unit: A15 Trade Related Math

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and ability to use mathematics with precision, resourcefulness and confidence. This unit is intended to help make the world of numbers and ratios work for, rather than against, the ironworker apprentice. Beginning with an overview of the importance of math to the trade, the unit covers strategies to address math anxiety, a review of general mathematical concepts including the use of calculators, and an overview of trade-related mathematics.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the practical importance of math disciplines to the Ironworker (Generalist) trade.	10%
a. Definition and scope of relevant math disciplines	
b. Time-sheets, wages, and personal budgeting	
c. Engineering of tools and equipment	
d. Manufacture and packaging of ironworker materials and products	
e. Trade documents, including manufacturers' specifications	
f. Computer technology/applications	
g. Design/technical drawing	
h. Work order preparation	
i. Machinery and equipment set-up	
j. Measurement and related test readings	
• Temperatures	
• Pressures	
• Other measured quantities	
k. Customer relations/perceptions (e.g. schedules, timetables, etc.)	
l. Business management	
2. Describe "math anxiety" and its remedies.	10%
a. Definition	
b. Recognition	
c. Options, resources, and techniques for overcoming math anxiety	
d. Other common problems	
• Importance of adult learner's recognition of existing math strengths and weaknesses	
• Importance of early resolution during term of apprenticeship	

- Options/resources for remedial math instruction and other assistance

3. Review general math concepts and use of electronic calculators. 50%

- a. Basic operations
 - Addition
 - Subtraction
 - Multiplication
 - Division
 - Order of operations
 - Fractions and decimals
- b. Ratio and proportion
- c. Percentage calculations
- d. Constructing/solving simple equations
- e. Trigonometry functions
- f. Units of measure
 - Imperial
 - Metric (SI)
 - Conversion factors
- g. Calculator use
 - Basic operation keys/functions
 - Percentage keys/functions
 - Trig keys/functions
 - Keys/functions re: memory and constants

4. Demonstrate trade-related calculations as specified by instructor. 30%

- a. Linear measurement
- b. Area and volume
- c. Ratio/proportion
 - Ratios
 - Percentages
 - Rates
- d. SI/Metric Units (including Conversions)
