

Red Seal Occupational Standard

Ironworker (Structural/ Ornamental)



red-seal.ca
sceau-rouge.ca



Red Seal Occupational Standard Ironworker (Structural/ Ornamental)



Title: Ironworker (Structural/Ornamental)

This publication is available for download at canada.ca/publiccentre-ESDC. It is also available upon request in multiple formats (large print, Braille, MP3, audio CD, e-text CD, DAISY, or Accessible PDF), by contacting 1 800 O-Canada (1-800-622-6232). By teletypewriter (TTY), call 1-800-926-9105.

© His Majesty the King in Right of Canada, 2025

For information regarding reproduction rights: droitdauteur.copyright@HRSDC-RHDCC.gc.ca.

Cat. No.: Em15-3/49-2025E-PDF

ISBN/ISSN: 978-0-660-74879-5

Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the Red Seal standard for the Ironworker (Structural/Ornamental) trade.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. Employment and Social Development Canada (ESDC) funds the Red Seal Program, which, under the guidance of the CCDA, develops a national occupational standard for each of the Red Seal trades.

Standards have the following objectives:

- to describe and group the tasks performed by skilled workers
- to identify which tasks are performed in every province and territory
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and assessment tools for apprenticeship and certification authorities
- to develop common tools for apprenticeship on-the-job and technical training in Canada
- to facilitate the mobility of apprentices and skilled workers in Canada
- to supply employers, employees, associations, industries, training institutions and governments with occupational standards

Any questions, comments, or suggestions for changes, corrections, or revisions to this standard or any of its related products may be forwarded to:

Trades and Apprenticeship Division
Apprenticeship and Sectoral Initiatives Directorate
Employment and Social Development Canada
140 Promenade du Portage, Phase IV
Gatineau, Quebec K1A 0J9

Acknowledgements

The CCDA and ESDC wish to express sincere appreciation for the contribution of the many tradespersons, industrial establishments, professional associations, labour organizations, provincial and territorial government departments and agencies, and all others who contributed to this publication.

Special thanks are offered to the following representatives who contributed greatly to the original draft of the standard and provided expert advice throughout its development.

The following lists these participants and the province/territory or organization that nominated them to attend the national development workshop.

- Dustin Borgford – International Association of Bridge, Structural, Ornamental and Reinforcing Ironworkers
- Matthew Kris Chambers – Alberta
- Barry Chetyrbok – Manitoba
- Desi Chrapko – Alberta
- Caelen Zachary Dunkley – British Columbia
- Keith Fergus – Ontario
- Christopher Forsyth – Alberta
- Neil Horne – Nova Scotia
- Clinton Knowlton – Ontario
- Gerald Lane – Newfoundland and Labrador
- Armand Leblanc – New Brunswick
- Kent MacDonald – Ontario
- Nicole Mahoney – Alberta
- James Michael McKoryk – British Columbia
- Greg O'Connor – Ontario
- Charles Richard – New Brunswick
- Kirk Sampson – Nova Scotia
- Sean Stapleton – Manitoba
- Gerry Tralenberg – British Columbia
- Trevor Taber – New Brunswick
- Mike Woodford – Newfoundland and Labrador
- Kim Zimmerman – Saskatchewan

This standard was prepared by the Apprenticeship and Sectoral Initiatives Directorate of ESDC. The coordinating, facilitating and processing of this standard were undertaken by employees of the standards development team of the Trades and Apprenticeship Division and of Manitoba and Alberta, the host jurisdictions for this trade.

Structure of the Occupational Standard

This standard contains the following sections:

Methodology: an overview of the process for development, review, validation and weighting of the standard

Description of the Ironworker (Structural/Ornamental) Trade: an overview of the trade's duties, work environment, job requirements, similar occupations and career progression

Trends in the Ironworker (Structural/Ornamental) Trade: some of the trends identified by industry as being the most important for workers in this trade

Skills for Success Summary: an overview of how each of the skills for success (formerly called essential skills) is applied in this trade

Roles and Opportunities for Skilled Trades in a Sustainable Future: an overarching description of how in the context of climate change, skilled trades play a large role in implementing solutions and adjusting to changes in the world. In addition to highlighting the importance of this awareness, the standard may also contain more details on activities, skills and knowledge elements that are specific to the trade

Industry Expected Performance: description of the expectations regarding the level of performance of the tasks, including information related to specific codes, regulations and standards that must be observed

Language Requirements: description of the language requirements for working and studying in this trade in Canada

Pie Chart of Red Seal Examination Weightings: a graph which depicts the national percentages of exam questions assigned to the major work activities

Task Matrix and Weightings: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard and the national percentages of exam questions assigned to the major work activities and tasks

Harmonization of Apprenticeship Training: the aspects of apprenticeship training that participating provinces and territories have agreed upon to substantively align apprenticeship systems across Canada

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities

- **Task:** distinct actions that describe the activities within a major work activity
- **Task Descriptor:** a general description of the task
 - **Sub-task:** distinct actions that describe the activities within a task

- **Skills:**
 - **Performance Criteria:** description of the activities that are done as the sub-task is performed
 - **Evidence of Attainment:** proof that the activities of the sub-task meet the expected performance of a tradesperson who has reached journey person level
 - **Range of Variables:** elements and examples (not all-inclusive) that provide a more in-depth description of a term used in the performance criteria and evidence of attainment
- **Knowledge:**
 - **Learning Outcomes:** describes what should be learned relating to a sub-task while participating in technical or in-school training
 - **Learning Objectives:** topics to be covered during technical or in-school training in order to meet the learning outcomes for the sub-task
 - **Range of Variables:** elements and examples (not all-inclusive) that provide a more in-depth description of a term used in the learning outcomes and learning objectives
- **Appendix A – Acronyms:** a list of acronyms used in the standard with their full name
- **Appendix B – Tools and Equipment / Outils et Équipement:** a bilingual non-exhaustive list of tools and equipment used in this trade
- **Appendix C – Glossary / Glossaire:** bilingual definitions or explanations of selected technical terms used in the standard

Methodology

Development of the Standard

A draft standard is developed by a broad group of trade representatives, including tradespeople, instructors and employers at a National Workshop led by a team of facilitators. This draft standard breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Harmonization of Apprenticeship Training

An analysis of all provinces' and territories' apprenticeship programs is performed, and recommendations are made on harmonizing the name of the trade, the hours of training required and the number of levels of training. Provinces and territories consult with their respective industry stakeholders on these elements and revisions are discussed until consensus is reached. Following the development of the workshop draft of the RSOS, participants discuss and come to consensus on the sequence of training topics, as expressed in the new standard. Their sequencing recommendations are reviewed by stakeholders in participating provinces and territories and further discussions are convened to reach consensus and to identify any exceptions.

Online Survey

Stakeholders are asked to review and validate the activities described in the new standard via an online survey. These stakeholders are invited to participate in this consultation through apprenticeship authorities, as well as national stakeholder groups.

Draft Review

The RSOS development team forwards a copy of the standard to provincial and territorial authorities who consult with industry representatives to review it. Their recommendations are assessed and incorporated into the standard.

Validation and Weighting

Participating provinces and territories also consult with industry to validate and weight the document for the purpose of planning the makeup of the Red Seal Interprovincial Examination for the trade. They validate and weight the major work activities (MWA), tasks and sub-tasks of the standard, as follows:

- **MWA** - Each jurisdiction assigns a percentage of questions to each MWA for an examination that would cover the entire trade.
- **Tasks** - Each jurisdiction assigns a percentage of exam questions to each task within a MWA.
- **Sub-tasks** - Each jurisdiction indicates, with a “yes” or “no”, whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the RSOS development team who then analyzes the data and incorporates it into the document. The RSOS provides the individual

jurisdictional validation results as well as the national averages of all responses. The national averages for MWA and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

The validation of the RSOS is used to identify common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions' industry performs a sub-task, it shall be considered common core. Interprovincial Red Seal Examination questions are limited to the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

| | |
|------------------------------|---|
| yes | sub-task performed by qualified workers in the occupation in that province or territory |
| no | sub-task not performed by qualified workers in the occupation in that province or territory |
| NV | standard <u>N</u> ot <u>V</u> alidated by that province or territory |
| ND | trade <u>N</u> ot <u>D</u> esignated in a province or territory |
| Not Common Core (NCC) | sub-task, task or MWA performed less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade |
| National Average % | average percentage of questions assigned to each MWA and task in Interprovincial Red Seal Examination for the trade |

Provincial/Territorial Abbreviations

| | |
|-----------|---------------------------|
| NL | Newfoundland and Labrador |
| NS | Nova Scotia |
| PE | Prince Edward Island |
| NB | New Brunswick |
| QC | Quebec |
| ON | Ontario |
| MB | Manitoba |
| SK | Saskatchewan |
| AB | Alberta |
| BC | British Columbia |
| NT | Northwest Territories |
| YT | Yukon Territory |
| NU | Nunavut |

Description of the Ironworker (Structural/Ornamental) Trade

“Ironworker (Structural/Ornamental)” is this trade’s official Red Seal occupational title approved by the CCDA. This standard covers tasks performed by ironworkers (structural/ornamental).

Ironworkers (structural/ornamental) install and reinforce structural/ornamental steel components, precast structural concrete members and mass timber products such as glue laminated timber (glulam), cross laminated timber (CLT), and nail and dowel laminated timber (NLT & DLT). Ironworkers (structural/ornamental) work is performed in commercial, industrial, institutional and large residential buildings, towers, bridges and stadiums. They erect pre-engineered buildings, wind turbines, solar panels and ornamental ironwork such as curtain walls, metal stairways, catwalks, railings and metal doors. They also erect scaffolding, cranes, hoists and derricks on the construction site. Ironworkers (structural/ornamental) also install conveyors, machinery and automated material handling systems. They are also involved in demolition and salvage duties involving all types of construction.

Ironworkers (structural/ornamental) prepare the construction site by assembling the hoisting equipment. They unload structural and ornamental components and organize the material for hoisting. They organize and sequence the hoisting of the components by connecting, choosing and installing rigging such as cables and slings to the components and directing crane operators. They position, align and secure components according to technical drawings using a variety of fastening methods.

Ironworkers (structural/ornamental) generally work outside in various weather conditions, although some work indoors. They generally travel to and from the work site which may be in a variety of locations ranging from remote areas where they could be working on dams, bridges or mining projects to urban environments where they could work on high rise buildings or stadiums. The work often requires considerable standing, bending, crawling, lifting, climbing, pulling and reaching, and is often conducted in cramped areas, confined spaces or at heights. Hazards include injury from falls from heights or falling objects, lacerations, pinch points, crushing and overexertion. Ironworkers (structural/ornamental) typically work a 40-hour week; however, inclement weather such as rain, snow or high winds may shut down projects for extended periods and alternative deadlines and priorities may require overtime hours.

Ironworkers (structural/ornamental) are required to have good mechanical aptitude, the ability to lift heavy objects, the ability to maintain balance working at heights in varying extreme climates, a thorough knowledge of the principles of welding, and rigging, hoisting and positioning, and a familiarity with a variety of metal fastening and joining methods. They are all required to be competent in the use and care of a variety of hand and power tools and equipment such as wrenches, pry bars, torches, levelling and welding equipment. Ironworkers (structural/ornamental) use material handling equipment such as forklifts (class 1-7), panel or glass lifting equipment and rolling hydraulic gantry systems. They also use crane charts and must be able to estimate and reconcile crane ability with load sizes.

Because of the nature of the work, a primary concern of ironworkers (structural/ornamental) is workplace safety. They must be thoroughly familiar with the applicable sections of local, provincial and federal building and safety standards.

Ironworkers (structural/ornamental) tend to work in teams and team coordination is a large component of the occupation especially when hoisting and placing large, heavy components high above the ground.

Ironworkers (structural/ornamental) interact and work cooperatively with a wide variety of construction tradespeople such as ironworkers (reinforcing), mobile and tower crane operators, welders, carpenters, metal fabricators (fitters), boilermakers, industrial mechanics (millwrights), construction craft workers and glaziers.

Trends in the Ironworker (Structural/Ornamental) Trade

Technology

The use of electronic devices such as tablets and laptops are now commonly used on-site for reviewing and marking up site documentation (e.g., prints, change orders).

Ironworkers (structural/ornamental) use digital technologies and software in structural design and fabrication. These enable ironworkers to access 3D models, simulations, and animations of ironwork structures and components created by detailers and designers. Digital technologies and software can help ironworkers (structural/ornamental) to visualize, plan, and optimize their work. They can also facilitate the communication and collaboration among ironworkers, engineers, architects and clients. Ironworkers (structural/ornamental) also use virtual and augmented reality tools for training purposes such as welding and mobile equipment training.

Ironworkers (structural/ornamental) may use drones, 3D laser scanners and cameras to inspect and monitor ironwork projects. Drones and cameras can provide aerial views and high-resolution images of ironwork structures and components. Digital technologies and software can help ironworkers (structural/ornamental) to identify defects, damages, or misalignments that may not be visible from the ground. They can also improve the safety and efficiency of ironwork operations by reducing the need for manual inspections and scaffolding.

Health and Safety

Ironworkers (structural/ornamental) and their employers are increasingly being supported in addressing and promoting mental health and well-being. Substance abuse programs are becoming more accepted and available in the trade.

There are improvements in personal protective equipment (PPE) and clothing for ironworkers (structural/ornamental) that can protect them from respiratory hazards such as toxic fumes and respiratory particulates, noise, heat, cold, radiation and burns.

There is a greater emphasis on process and documentation of work to prevent and monitor workplace injuries and overexertion, as well as to support recovery. Safety performance is extremely important for a contractor's ability to bid on projects.

Tools and Equipment

There are more advanced hoisting and rigging tools and equipment, such as remote crane hooks, hydraulic gantries and self-propelled modular transporters (SPMTs). These tools and equipment are used by ironworkers (structural/ornamental) to move materials and equipment.

There is a greater variety of mobile equipment (e.g., rough terrain forklifts, mini cranes, mobile elevating work platforms) used by ironworkers (structural/ornamental). Cordless tools are replacing hydraulic and pneumatic tools.

There is also an increase in the variety of torque/tensioning equipment such as a turn of nut gun and a tension control (TC) gun for tensioning and verification of structural fasteners. This equipment is used for tensioning and verification of structural fasteners. There are advanced and automatic welding procedures used in fabrication and installation.

For decking, it is becoming more common for engineering specifications to require components to be fastened mechanically, using powder-actuated techniques instead of welding.

There are more computerized and automated machines used in fabrication of components.

Improvements in rope access equipment is emerging to replace the use of scaffolding. This is used to access challenging locations for tasks such as inspection and installation.

Products/Materials

New materials and products are being developed and improved. Products such as delta beams, corrugated web beams, helical screw piles and composite materials such as timber-concrete-hybrid panels and glass-fiber reinforced polymers (GFRP) have become more prevalent. Also, it is a trend to use larger mass timber structural components such as cross-laminated timber (CLT) and glulam (GLT) in addition to steel or concrete.

Ironworkers (structural/ornamental) may also need to work with specialty metals, precast and pretensioned concrete.

Some specialized construction materials for the small modular reactor nuclear sector includes steel-brick modular wall systems, which are installed by ironworkers (structural/ornamental).

The design of structures exposed to seismic and cyclic loading is constantly evolving and ironworkers (structural/ornamental) are continuously adapting to new construction methodology. These new designs have introduced changes for bolted and welded connections as well as reinforced concrete in structures.

Environmental

Ironworkers (structural/ornamental) are involved in various environmental advances in their trade. They work with recycled steel and other products that can save resources and reduce emissions compared to new materials.

They participate in green building projects that can improve the energy efficiency and sustainability of buildings and structures. Green building practices can include using renewable energy sources, minimizing waste, enhancing indoor environmental quality, and reducing the environmental footprint of construction.

Ironworkers (structural/ornamental) can work on renewable energy generation and green building projects such as hydroelectric facilities, battery and electric vehicle assembly plants, solar arrays, wind turbines, green roofs, hydrogen plants and other eco-friendly features.

Legislative and Regulatory

Ironworkers (structural/ornamental) need to stay up-to-date on building code changes. The introduction and emphasis of energy efficiency code requirements has impacted trade practices including more traceability and accountability for materials and processes for building construction.

Safety regulations and legislation in each jurisdiction are also subject to frequent updates and changes.

Other

Depending on jurisdictional regulations and standards, welding is an important skill for many ironworkers (structural/ornamental), as they need to form structures and components from metal pieces. Ironworkers (structural/ornamental) use new welding techniques and equipment to join metal pieces together. New welding techniques and equipment can improve the quality and durability of structural products and systems.

As new rigging technology emerges, ironworkers (structural/ornamental) will be required to stay abreast of current and future trends to facilitate the hoisting and maneuvering of construction materials, components, and machinery safely and efficiently while following local and national safety standards and regulations.

Skills for Success Summary

Skills for Success are needed in a quickly changing world for work, learning and life. They are foundational for building other skills and important for effective social interaction. Everyone benefits from having these skills as they help individuals get a job, progress at their current job and change jobs. They also help individuals become active members of their community and succeed in learning.

Through extensive research and consultations, the Government of Canada launched the new Skills for Success model renewing the previous Essential Skills framework to better reflect the needs of the current and future labour market.

The summary presented here is based on existing Essential Skills profiles and will be updated to align with the new [Skills for Success model](#) over time.

Reading

Ironworkers (structural/ornamental) need to read various texts for their work. They read drawings to know how to cut and place materials. They read instructions for travel to job sites and descriptions of equipment, tools and supplies to take with them. They read notes on jobsite bulletin boards to stay updated on meetings and health and safety issues such as the location of hazardous areas. They read inspection reports to avoid hazards and unsafe conditions. They read notifications from their employers and unions to follow new procedures and standards. They read health and safety policies to know the rules and expectations for their job tasks. They read collective agreements to understand their rights and benefits. They read trade publications, articles and newsletters to learn about training opportunities and new products. They read manufacturer specifications for a variety of reasons including information to properly install and maintain equipment and components.

Document Use

Ironworkers (structural/ornamental) use various documents to locate data, complete forms, and review drawings. They use manufacturer specifications to locate information regarding the products, tools and equipment that they work with. They read signs and labels to find material codes, safety hazards and placement coordinates. They use Safety Data Sheets to locate material, hazard, and safety information for the products they work with. They use tables and lists to find information about the weight, size and type of materials and tools required. They fill out forms and checklists to record their hours, inspections, measurements, and incidents. They study assembly drawings to determine sequences and to verify order and size of steel structures. They also read engineered specifications and construction drawings to find dimensions and angles of steel.

Writing

Ironworkers (structural/ornamental) may write work-related messages to co-workers, job instructions, and brief notes and comments on their daily logbook and drawings. They are responsible for all record-keeping requirements related to their work. They also write descriptions and explanations when completing requests for information and to report non-conformance, safety concerns, incidents or accidents.

Oral Communication

Ironworkers (structural/ornamental) participate in toolbox meetings to learn about their tasks, job site safety and special instructions. They speak with supervisors, co-workers, and other trade workers throughout the day to coordinate work locations, installation sequences and techniques, and access to workspaces. They may also give instructions and provide guidance to apprentices and journeypersons on various procedures. They interact daily with ironworkers (structural/ornamental), crane operators, other workers and supervisors during hazardous activities, such as connecting, hoisting and installing steel and steel reinforced structures.

They must communicate clearly to ensure safety and efficiency. They must communicate respectfully to support a healthy workplace.

Numeracy

Ironworkers (structural/ornamental) use math skills to measure and calculate various aspects of their work, such as the dimensions, distances, angles, weights of loads and times involved in installing structural steel. They also compare their measurements to the specifications to ensure steel columns, beams, and fabricated and reinforced structures are correctly fabricated and installed. They estimate the quantities of supplies they need, the time they will take to complete tasks and the weight of materials they will handle.

Thinking

Ironworkers (structural/ornamental) use critical thinking skills to perform diagnostics, trouble-shooting and problem solving tasks. They make decisions about the tools needed, labour requirements, methods and safety of the worksite, based on standard criteria and their own judgment. They evaluate the quality and efficiency of the work by inspecting the site, materials, supplies, equipment and installation sequences. They plan and organize their own tasks according to the assignments and priorities given by their supervisors, and coordinate with other workers on the job site.

Working with Others

Due to the potentially dangerous nature of their work, working with others is a critical skill. Ironworkers (structural/ornamental) work in large team situations and with other tradespeople. They must be able to communicate effectively, complete the tasks assigned to them and integrate their work with that of the other trades. They must be mindful of their actions and support a respectful workplace that is safe, inclusive and free of harassment and discrimination

Digital Technology

It is increasingly important for ironworkers to be computer-literate. Ironworkers (structural/ornamental) may use digitized programmable equipment such as scientific calculators, digital levels and lasers. They may also use automation equipment (robotics) and computer-controlled equipment such as welding overlays and computer numerical controlled (CNC) cutting machines. Ironworkers (structural/ornamental) may use computer-assisted training tools such as on-line programs, simulators, or software packages for quality assurance, and health and safety training. They may also use computer-aided design (CAD) software and Building Information Modeling (BIM). Ironworkers (structural/ornamental) may use portable devices such as laptops, tablets and smart phones, along with relevant software for job site documentation.

Continuous Learning

Technical upgrading is offered by companies when new products, procedures and equipment are introduced. Ironworkers (structural/ornamental) may take courses on the job, at community colleges, at their local unions, or access on-line programs. However, one of the most practical ways for ironworkers to gain new expertise is to learn on the job from more experienced co-workers, mentors or supervisors. It is common for ironworkers (structural/ornamental) to also have a welding certification.

Ironworkers interested in career advancement can access foreman and superintendent training from various sources including local union halls.

Roles and Opportunities for Skilled Trades in a Sustainable Future

Climate change affects all of us. Trades play a large role in implementing solutions and adjusting to changes in the world.

Throughout this standard, there may be specific references to tasks, skills and knowledge that clearly show this trade's role in a more sustainable future. Each trade has different roles to play and contributions to make in their own way.

For example:

- Construction tradespeople need to consider the materials they are using, building methods, and improvements to mechanical and electrical installations. There are important changes to codes and standards to help meet the climate change goals and commitments set for 2030 and 2050. Retrofits and new construction of low-energy buildings provide enormous opportunities for workers in this sector. Concepts, such as energy efficiency and regarding buildings as systems are foundational.
- Automotive and mechanical trades are seeing a shift towards the electrification of vehicles and equipment. As a result, new skills and knowledge will be required for tradespeople working in this sector. There are mandates for sales of new light-duty zero-emission vehicles (ZEV) in Canada, with the goal of achieving 100% ZEV sales by 2035. Due to this mandate, the demand for these vehicles is growing quickly among consumers and fleets. With this escalating demand, the need for skilled workers to maintain and repair these vehicles is also increasing.
- In industrial and resource sectors, there is pressure to move towards increased electrification of industrial processes. Many industrial and commercial facilities are also being upgraded to improve energy efficiency in areas such as lighting systems, and new production processes and technologies. There are also opportunities in carbon capture, utilization and storage (CCUS), as well as the production and export of low-carbon hydrogen.
- Trades in the service sector may also need to be aware of responsible sourcing, as well as efficient use of products and materials. New ways of working better are always a part of the job.

There are fast-moving changes in guidelines, codes, regulations and specifications. Many are being implemented for the purpose of energy efficiency and climate change. Those that affect specific trades may be mentioned within the standard. Examples of these guidelines and legislation include:

- *National Energy Code of Canada for Buildings* (NECB).
- Canadian Net-Zero Emissions Accountability Act (CNZEAA).
- Programs that encourage sustainable building design and construction such as Leadership in Energy and Environmental Design (LEED) and the Zero Carbon Building (ZCB) standards.
- Montreal Protocol for phasing out R22 refrigerants.

- Energy efficiency programs such as ENERGY STAR.
- Principles of the United Nations Declaration for the Rights of Indigenous Peoples pertaining to energy sector development.

Apprentices and tradespeople need to increase their climate literacy and reinforce their own understanding of energy issues and environmental practices. It is important for them to understand why these changes are happening and their effect on trades' work. While individual tradespeople and apprentices may not be able to choose certain elements like; the architectural design of buildings, building material selection, regulatory requirements, use of electric vehicles and technologies, they must understand the impact of using these elements in their work. Impacts include using environmentally friendly products and following requirements related to the disposal and recycling of materials.

In apprenticeship, as well as in ongoing professional development, employers and instructors should encourage learning about these concepts, why they are important, how they are implemented, and the overarching targets they are aiming to achieve.

All in all, it's about doing the work better and building a better world.

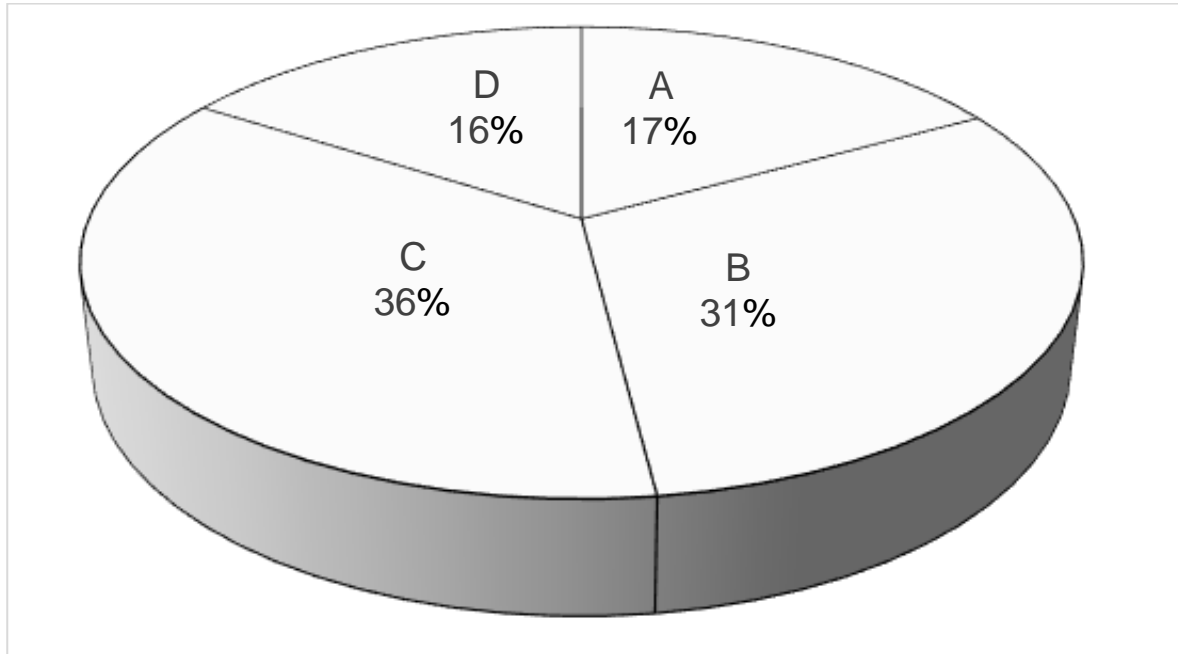
Industry Expected Performance

All tasks must be performed according to the applicable jurisdictional codes and standards. All health and safety standards must be respected and observed. Work should be performed efficiently and to a high quality without material waste or environmental damage. All requirements of employers, engineers, designers, manufacturers, clients and quality control policies must be met. At a journeyperson level of performance, all tasks must be done with minimal direction and supervision. As a journeyperson progresses in their career there is an expectation they continue to upgrade their skills and knowledge to maintain pace with industry and promote continuous learning in their trade through mentoring of apprentices.

Language Requirements

It is expected that journeypersons are able to understand and communicate in either English or French, which are Canada's official languages. English or French are the common languages of business as well as languages of instruction in apprenticeship programs.

Pie Chart of Red Seal Examination and Weightings



Major Work Activity

Percentage

A - Performs common occupational skills

17%

B - Performs rigging, hoisting and positioning, and mobilization, erection, and demobilization of cranes

31%

C - Performs erection, assembly and installation

36%

D - Performs maintenance and upgrading

16%

This pie chart represents a breakdown of the interprovincial Red Seal examination. Percentages are based on the collective input from workers from the trade from across Canada. The Task Matrix on the next pages indicates the breakdown of tasks and sub-tasks within each Major Work Activity and the breakdown of questions assigned to the Tasks. The Interprovincial examination for this trade has 120 questions.

Task Matrix and Weightings

A – Performs common occupational skills

17%

| | | | |
|---|--|--|--|
| Task A-1 Maintains safe and healthy workplace 27% | Sub-task A-1.01 Maintains safe work environment | Sub-task A-1.02 Uses personal protective equipment (PPE) and safety equipment | Sub-task A-1.03 Participates in healthy and respectful work environment |
| Task A-2 Uses and maintains tools and equipment 36% | Sub-task A-2.01 Uses hand tools and measuring equipment | Sub-task A-2.02 Uses power tools | Sub-task A-2.03 Uses powder-actuated tools |
| | Sub-task A-2.04 Uses mobile elevating work platforms (MEWP) | Sub-task A-2.05 Uses material handling equipment | Sub-task A-2.06 Uses ladders |
| | Sub-task A-2.07 Uses scaffolding | Sub-task A-2.08 Uses surveying equipment | Sub-task A-2.09 Uses welding equipment |
| | Sub-task A-2.10 Uses mechanical cutting equipment | Sub-task A-2.11 Uses thermal cutting equipment | |
| | Sub-task A-3.01 Organizes materials and supplies | Sub-task A-3.02 Performs layout | Sub-task A-3.03 Uses drawings and documentation |
| Organizes work Task A-3 30% | Sub-task A-3.04 Plans tasks | | |

| | | |
|---|---|--|
| Task A-4 Maintains continuous learning 3% | Sub-task A-4.01 Upskills in new trade practices and procedures | Sub-task A-4.02 Upskills in emerging technologies |
| Task A-5 Uses communication and mentoring techniques 4% | Sub-task A-5.01 Uses communication techniques | Sub-task A-5.02 Uses mentoring techniques |

B - Performs rigging, hoisting and positioning, and mobilization, erection, and demobilization of cranes 31%

| | | | |
|--|---|--|--|
| Task B-6 Plans lift 26% | Sub-task B-6.01 Assesses load | Sub-task B-6.02 Performs pre-lift analysis | Sub-task B-6.03 Selects rigging, hoisting and positioning equipment |
| | Sub-task B-6.04 Secures lift area | | |
| Task B-7 Rigs, hoists and positions load 38% | Sub-task B-7.01 Inspects rigging, hoisting and positioning equipment | Sub-task B-7.02 Assembles rigging, hoisting and positioning equipment | Sub-task B-7.03 Attaches rigging equipment to load |
| | Sub-task B-7.04 Performs hoisting and positioning operations | Sub-task B-7.05 Secures load before rigging removal | |

| | | | |
|--|---|--|--|
| Task B-8 Performs post-lift activities 17% | Sub-task B-8.01 Conducts post-lift inspection | Sub-task B-8.02 Disassembles rigging, hoisting and positioning equipment | Sub-task B-8.03 Maintains rigging, hoisting and positioning equipment |
| Task B-9 Performs mobilization, erection, and demobilization of cranes 19% | Sub-task B-9.01 Mobilizes telescopic boom cranes | Sub-task B-9.02 Erects lattice boom cranes, tower cranes, derricks and components | Sub-task B-9.03 Performs demobilization and disassembly of cranes |

C – Performs erection, assembly and installation

36%

| | | | |
|---|--|---|---|
| Task C-10 Installs primary and secondary structural members 47% | Sub-task C-10.01 Uses falsework | Sub-task C-10.02 Attaches structural members | Sub-task D-10.03 Levels, plumbs and aligns structural members |
| | Sub-task C-10.04 Completes installation of structural members | | |
| Task C-11 Installs ornamental, miscellaneous, and steel cladding systems and components 27% | Sub-task C-11.01 Installs curtain walls and window walls | Sub-task C-11.02 Installs miscellaneous components | Sub-task C-11.03 Installs steel cladding, and building envelope systems and components |
| Task C-12 Installs conveyors, machinery and equipment 26% | Sub-task C-12.01 Installs material handling systems | Sub-task C-12.02 Performs alignment and commissioning of material handling systems | |

D – Performs maintenance and upgrading

16%

| | | | |
|--|--|---|--|
| Task D-13 Decommissions, disassembles and removes structural, ornamental, mechanical and miscellaneous components 50% | Sub-task D-13.01 Ensures decommissioning of structure and components | Sub-task D-13.02 Disassembles structural, ornamental, mechanical and miscellaneous components | |
| Task D-14 Maintains and repairs components 50% | Sub-task D-14.01 Assesses current condition of components | Sub-task D-14.02 Performs repairs, revisions and reinforcing of components | Sub-task D-14.03 Replaces components |
| | Sub-task D-14.04 Performs preventative maintenance | | |

Harmonization of Apprenticeship Training

Provincial and territorial apprenticeship authorities are each responsible for their respective apprenticeship programs. In the spirit of continual improvement, and to facilitate mobility among apprentices in Canada, participating authorities have agreed to work towards harmonizing certain aspects of their programs where possible. After consulting with their stakeholders in the trade, they have reached consensus on the following elements. Note that implementation of these elements may vary from jurisdiction to jurisdiction, depending on their own circumstances. For more information on the implementation in any province and territory, please contact that jurisdiction's apprenticeship authority.

1. Trade Name

The official Red Seal name for this trade is Ironworker (Structural/Ornamental).

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for this trade is three (3).

3. Total Training Hours

The total hours of training, including both on-the-job and in-school training for this trade is 5400.

4. Sequencing Topics and Related Sub-tasks

The topic titles in the table below are placed in a column for each apprenticeship level for technical training. Each topic is accompanied by the sub-tasks and their reference number. The topics in the grey shaded cells represent those that are covered "in context" with other training in the subsequent years.

| Level 1 | Level 2 | Level 3 |
|---|----------------------------|----------------------------|
| | Context | Context |
| | Safe and Healthy Workspace | Safe and Healthy Workspace |
| | Tools and Equipment | Tools and Equipment |
| | Communication | Communication |
| Safe and Healthy Workspace 1.01 Maintains safe work environment 1.02 Uses PPE and safety equipment 1.03 Participates in healthy and respectful work environment | | |

| | | |
|--|--|--|
| Tools and Equipment 2.01 Uses hand tools and measuring tools 2.02 Uses power tools 2.03 Uses powder-actuated tools 2.04 Uses mobile elevating work platforms (MEWP) 2.05 Uses ladders 2.06 Uses material handling equipment 2.07 Uses scaffolding 2.08 Uses surveying equipment 2.09 Uses welding equipment 2.10 Uses mechanical cutting equipment 2.11 Uses thermal cutting equipment | Tools and Equipment 2.08 Uses surveying equipment 2.09 Uses welding equipment 2.11 Uses thermal cutting equipment | Tools and Equipment 2.08 Uses surveying equipment 2.09 Uses welding equipment 2.11 Uses thermal cutting equipment |
| Organizes Work 3.01 Organizes materials and supplies 3.02 Performs layout 3.03 Uses drawings and documentation 3.04 Plans tasks | Organizes Work 3.01 Organizes materials and supplies 3.02 Performs layout 3.03 Uses drawings and documentation 3.04 Plans tasks | Organizes Work 3.01 Organizes materials and supplies 3.02 Performs layout 3.03 Uses drawings and documentation 3.04 Plans tasks |
| | | Continuous Learning 4.01 Upskills in new trade practices and procedures 4.02 Upskills in emerging technologies |
| Communication 5.01 Uses communication techniques | | Mentoring 5.02 Uses mentoring techniques |

| | | |
|--|--|--|
| <p>Lift Planning</p> <p>6.01 Assesses load</p> <p>6.02 Performs pre-lift analysis</p> <p>6.03 Selects rigging, hoisting and positioning equipment</p> <p>6.04 Secures lift area</p> | <p>Lift Planning</p> <p>6.01 Assesses load</p> <p>6.02 Performs pre-lift analysis</p> <p>6.03 Selects rigging, hoisting and positioning equipment</p> <p>6.04 Secures lift area</p> | <p>Lift Planning</p> <p>6.01 Assesses load</p> <p>6.02 Performs pre-lift analysis</p> <p>6.03 Selects rigging, hoisting and positioning equipment</p> <p>6.04 Secures lift area</p> |
| <p>Rigging, Hoisting and Positioning Loads</p> <p>7.01 Inspects rigging, hoisting and positioning equipment</p> <p>7.02 Assembles rigging, hoisting and positioning equipment</p> <p>7.03 Attaches rigging equipment to load</p> <p>7.04 Performs hoisting and positioning operations</p> <p>7.05 Secures load before rigging removal</p> | <p>Rigging, Hoisting and Positioning Loads</p> <p>7.01 Inspects rigging, hoisting and positioning equipment</p> <p>7.02 Assembles rigging, hoisting and positioning equipment</p> <p>7.03 Attaches rigging equipment to load</p> <p>7.04 Performs hoisting and positioning operations</p> <p>7.05 Secures load before rigging removal</p> | <p>Rigging, Hoisting and Positioning Loads</p> <p>7.01 Inspects rigging, hoisting and positioning equipment</p> <p>7.02 Assembles rigging, hoisting and positioning equipment</p> <p>7.03 Attaches rigging equipment to load</p> <p>7.04 Performs hoisting and positioning operations</p> <p>7.05 Secures load before rigging removal</p> |
| <p>Post-Lift Activities</p> <p>8.01 Conducts post-lift inspection</p> <p>8.02 Disassembles rigging, hoisting and positioning equipment</p> <p>8.03 Maintains rigging, hoisting and positioning equipment</p> | <p>Post-Lift Activities</p> <p>8.01 Conducts post-lift inspection</p> <p>8.02 Disassembles rigging, hoisting and positioning equipment</p> <p>8.03 Maintains rigging, hoisting and positioning equipment</p> | <p>Post-Lift Activities</p> <p>8.01 Conducts post-lift inspection</p> <p>8.02 Disassembles rigging, hoisting and positioning equipment</p> <p>8.03 Maintains rigging, hoisting and positioning equipment</p> |
| <p>Crane Mobilization, Erection and Demobilization</p> <p>9.01 Mobilizes telescopic boom cranes</p> <p>9.02 Erects lattice boom cranes, tower cranes, derricks and components</p> <p>9.03 Performs demobilization and disassembly of cranes</p> | <p>Crane Mobilization, Erection and Demobilization</p> <p>9.01 Mobilizes telescopic boom cranes</p> <p>9.02 Erects lattice boom cranes, tower cranes, derricks and components</p> <p>9.03 Performs demobilization and disassembly of cranes</p> | <p>Crane Mobilization, Erection and Demobilization</p> <p>9.01 Mobilizes telescopic boom cranes</p> <p>9.02 Erects lattice boom cranes, tower cranes, derricks and components</p> <p>9.03 Performs demobilization and disassembly of cranes</p> |

| | | |
|--|--|--|
| Installation of Primary and Secondary Structural Members 10.01 Uses falsework 10.02 Attaches structural members 10.03 Levels, plumbs and aligns structural members 10.04 Completes installation of structural members | Installation of Primary and Secondary Structural Members 10.01 Uses falsework 10.02 Attaches structural members 10.03 Levels, plumbs and aligns structural members 10.04 Completes installation of structural members | Installation of Primary and Secondary Structural Members 10.01 Uses falsework 10.02 Attaches structural members 10.03 Levels, plumbs and aligns structural members 10.04 Completes installation of structural members |
| | Installation of Ornamental, Miscellaneous and Steel Cladding Components and Systems 11.03 Installs steel cladding and building envelope components and systems | Installation of Ornamental, Miscellaneous and Steel Cladding Components and Systems 11.01 Installs curtain walls and window walls 11.02 Installs miscellaneous components |
| | Installation of Conveyors, Machinery and Equipment 12.01 Installs material handling systems 12.02 Performs alignment and commissioning of material handling systems | Installation of Conveyors, Machinery and Equipment 12.01 Installs material handling systems 12.02 Performs alignment and commissioning of material handling systems |
| | Decommissioning, Disassembly and Removal of Structural, Ornamental, Mechanical and Miscellaneous Components 13.01 Ensures decommissioning of structure and components 13.02 Disassembles structural ornamental, mechanical and miscellaneous components | Decommissioning, Disassembly and Removal of Structural, Ornamental, Mechanical and Miscellaneous Components 13.01 Ensures decommissioning of structure and components 13.02 Disassembles structural ornamental, mechanical and miscellaneous components |

| Maintenance and Repair | Maintenance and Repair |
|---|---|
| 14.01 Assesses current condition of components | 14.01 Assesses current condition of components |
| 1402 Performs repairs and revisions of components | 1402 Performs repairs and revisions of components |
| 14.03 Replaces components | 14.03 Replaces components |
| 14.04 Performs preventative maintenance | 14.04 Performs preventative maintenance |

Major Work Activity A - Performs common occupational skills

Task A-1 Maintains safe and healthy workplace

Task Descriptor

Ironworkers (structural/ornamental) participate in ensuring a safe, healthy and inclusive workplace. They must be able to protect themselves, others, property and the environment. The use and maintenance of personal protective equipment (PPE) and safety equipment are essential to every job. Ironworkers (structural/ornamental) assess sites and perform mitigation measures to eliminate or control any potential or immediate hazard, address an incident or accident, and follow up to ensure the safety and wellness of every person on the work site.

A-1.01 Maintains safe work environment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-1.01.01P | participate in safety and toolbox meetings and discussions | safety and toolbox meetings and discussions are participated in to ensure information is understood, shared and demonstrated |
| A-1.01.02P | perform job hazard analysis (JHA) and complete safety documentation | JHA is performed, worksite hazards are identified, eliminated or controlled, and safety documentation is completed and updated according to jurisdictional regulations, and company policies and procedures |
| A-1.01.03P | reference safety regulations | safety regulations are followed by workers on site according to jurisdictional regulations, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| A-1.01.04P | locate and interpret Workplace Hazardous Materials Information System (WHMIS) documents | WHMIS materials are located and interpreted, and directions on Safety Data Sheets (SDS) are followed |
| A-1.01.05P | install safety equipment | safety equipment is installed according to engineering and manufacturers' specifications, site-specific requirements and jurisdictional regulations |
| A-1.01.06P | follow safe work procedures | safe work procedures are followed according to task, and company policies and procedures |
| A-1.01.07P | identify and report unsafe conditions and worksite hazards | unsafe conditions and worksite hazards are reported to supervisor and Health and Safety Representative, and documented according to jurisdictional regulations, and company policies and procedures |
| A-1.01.08P | control evolving worksite hazards | evolving worksite hazards are eliminated or controlled as soon as possible, and information is documented and communicated to supervisor and Health and Safety Representative immediately according to jurisdictional regulations, and company policies and procedures |
| A-1.01.09P | communicate worksite hazards to supervisor and co-workers | worksite hazards are communicated to supervisor and co-workers using various methods |
| A-1.01.10P | keep site tidy and organized (housekeeping) | site is free of obstructions, debris and clutter |
| A-1.01.11P | coordinate tasks with other workers | tasks are coordinated with other workers to avoid injury to self and others according to jurisdictional regulations, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|-----------------------------------|---|
| A-1.01.12P | manage hazardous materials | hazardous materials are handled according to WHMIS and Transportation of Dangerous Goods (TDG) procedures , and safe work practices |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|--|
| safety documentation | field-level risk assessments (FLRA), hazard assessments, equipment inspections, incident reports |
| worksite hazards | floor openings, leading edges, obstructions, temporary supports, impalement, chemical, corrosive and ultra-violet (UV) environments, musculoskeletal injury (MSI), eye injuries, cuts, electrocution, toxic gases, liquids and materials, combustive reactions, fire, moving equipment, working at heights, confined spaces, noise, stored potential energy, compressed gases, environmental conditions, overhead obstacles, overhead work, underground utilities, poor housekeeping, , trenching and shoring, hot work, asbestos, vibration, trips, falls, respiratory particulates |
| safety regulations | lock-out and tag-out, jurisdictional Occupational Health and Safety (OHS), site-specific, TDG, WHMIS |
| safety equipment | guard rails, horizontal and vertical lifelines, retractable lifelines, screens, temporary work platforms, warning signs and barriers |
| methods | verbally, safety meetings, sirens, warning lights, flagging off area, putting up signage |
| hazardous materials | lead, chromium, asbestos, combustible materials, solvents, acids, oxidizers, pressurized gases, zinc (site specific), silica |
| WHMIS and TDG procedures | disposal, labelling, handling, transportation, using personal protective equipment (PPE), SDS |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-1.01.01L | demonstrate knowledge of procedures to maintain safe work environment | <ul style="list-style-type: none"> a. identify safety equipment used to maintain safe work environment, and describe their procedures for use b. identify worksite hazards, and describe procedures to mitigate and eliminate potential risks c. describe procedures to maintain safe work environment d. describe procedures to handle, store, transport and dispose of hazardous materials e. describe fundamentals of housekeeping f. describe procedures to inspect work environment |
| A-1.01.02L | demonstrate knowledge of procedures for emergency response | <ul style="list-style-type: none"> a. identify and describe company, site-specific and jurisdictional procedures for emergency response |
| A-1.01.03L | demonstrate knowledge of training and certification requirements to maintain safe work environment | <ul style="list-style-type: none"> a. identify training and certification requirements to maintain safe work environment |
| A-1.01.04L | demonstrate knowledge of regulatory requirements pertaining to maintaining safe work environment | <ul style="list-style-type: none"> a. identify codes, standards and safety regulations pertaining to maintaining safe work environment |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| safety equipment | guard rails, horizontal and vertical lifelines, retractable lifelines, screens, temporary work platforms, warning signs and barriers |
| worksite hazards | floor openings, leading edges, obstructions, temporary supports, impalement, chemical, corrosive and ultra-violet (UV) environments, musculoskeletal injury (MSI), eye injuries, cuts, electrocution, toxic gases, liquids and materials, combustive reactions, fire, moving equipment, working at heights, confined spaces, noise, stored potential energy, compressed gases, environmental conditions, overhead obstacles, overhead work, underground utilities, poor housekeeping, , trenching and shoring, hot work, asbestos, vibration, trips, falls, respiratory particulates |
| hazardous materials | lead, chromium, asbestos, combustible materials, solvents, acids, oxidizers, pressurized gases, zinc (site specific), silica |
| safety regulations | lock-out and tag-out, jurisdictional Occupational Health and Safety (OHS), site-specific, TDG, WHMIS |

A-1.02 Uses personal protective equipment (PPE) and safety equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| A-1.02.01P | select and use PPE and safety equipment | PPE and safety equipment are selected and used according to task |
| A-1.02.02P | use fall protection equipment | fall protection equipment is used according to manufacturers' specifications, company policies and procedures, and jurisdictional and site-specific requirements |
| A-1.02.03P | use rope access equipment | rope access equipment is used according to manufacturers' specifications, company policies and procedures, and jurisdictional and site-specific requirements |

| Reference Code | Performance Criteria | Evidence of Attainment |
|-----------------------|--|---|
| A-1.02.04P | inspect and identify damaged, worn and unsafe PPE and safety equipment, document and remove from service | inspection is performed, and damaged, worn and unsafe PPE and safety equipment is identified, documented and removed from service according to manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| A-1.02.05P | store and maintain PPE and safety equipment | PPE and safety equipment is stored and maintained according to manufacturers' specifications, and jurisdictional regulations, company policies and procedures |
| A-1.02.06P | locate and access PPE and safety equipment information | PPE and safety equipment information is located and accessed according to jurisdictional regulations, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|---|---|
| fall protection equipment | harnesses, lanyards, lifelines (vertical, retractable, horizontal), fall arrest equipment, travel restraints, guard rails, safety nets, rope grabs, anchorages, dowel protection, impalement protection, fall and rope access equipment |
| rope access equipment | harness, rope, lanyards, other connecting equipment, anchors, ascenders, descenders, belay devices, backup devices, fall arresters |
| PPE and safety equipment information | SDS, manufacturer's specifications, user manuals, technical data, jurisdictional regulations, engineering specifications |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|---|
| A-1.02.01L | demonstrate knowledge of PPE and safety equipment, their characteristics, applications and operation | <ul style="list-style-type: none"> a. identify PPE and safety equipment, and describe their characteristics and applications b. describe operating principles of PPE and safety equipment c. interpret PPE and safety equipment information found on drawings and manufacturers' specifications |
| A-1.02.02L | demonstrate knowledge of procedures to use PPE and safety equipment | <ul style="list-style-type: none"> a. identify types of PPE and safety equipment, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to using PPE and safety equipment c. describe procedures to inspect PPE and safety equipment d. describe procedures to store and maintain PPE and safety equipment e. describe procedures to dispose of PPE and safety equipment |
| A-1.02.03L | demonstrate knowledge of training and certification requirements to use fall protection equipment , PPE and safety equipment | <ul style="list-style-type: none"> a. identify training and certification requirements to use fall protection equipment, PPE and safety equipment |
| A-1.02.04L | demonstrate knowledge of regulatory requirements pertaining to using fall protection equipment , PPE and safety equipment | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to using fall protection equipment, PPE and safety equipment |

Range of Variables (include, but not limited to)

| | |
|---|---|
| PPE and safety equipment information | SDS, manufacturer's specifications, user manuals, technical data, jurisdictional regulations, engineering specifications |
| hazards | toxic fumes, respiratory particulates, falls from heights, falling objects, flying debris, UV radiation, burns, repetitive motions, sharps, impalement from objects or material |
| fall protection equipment | harnesses, lanyards, lifelines (vertical, retractable, horizontal), fall arrest equipment, travel restraints, guard rails, safety nets, rope grabs, anchorages, dowel protection, impalement protection, fall and rope access equipment |

A-1.03 Participates in healthy and respectful work environment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-1.03.01P | perform self-assessment of physical and mental health | self-assessment of physical and mental health is performed, and signs and symptoms of health concerns are identified |
| A-1.03.02P | identify supports and resources for personal mental and physical health | supports and resources for personal mental and physical health are identified |
| A-1.03.03P | identify techniques to manage health and wellness | techniques to manage health and wellness are identified |
| A-1.03.04P | assess personal job satisfaction | personal job satisfaction is assessed, and concerns are discussed with management |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-1.03.05P | create plan to manage work-life balance | plan is created to manage work-life balance and discussed with supervisors |
| A-1.03.06P | support and promote anti- harassment and anti- discrimination practices in workplace | workplace is harassment and discrimination -free |

Range of Variables (include, but not limited to)

| | |
|---|---|
| supports and resources | professional networks and associations, collaboration with colleagues and community members, counselling, mentoring, peer support groups, paramedical services, employee assistance plan (EAP) |
| techniques to manage health and wellness | practicing techniques for remaining physically, mentally and emotionally “fit for work”, managing personal and work life, recognizing the effects and consequences of alcohol, over-the-counter drugs, prescription drugs or illegal drugs before, during and after work, using personal hygiene habits |
| personal job satisfaction | financial, hours, flexibility, supports, working conditions |
| harassment | as defined by the Canadian and jurisdictional Human Rights Commissions |
| discrimination | as defined by the Canadian Human Rights Act and jurisdictional human rights laws |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-1.03.01L | demonstrate knowledge of personal health and well-being | <ul style="list-style-type: none"> a. describe how personal health and well-being impacts professional practice and healthy work environments b. identify and describe physical and emotional requirements of trade c. identify workplace stressors d. describe elements of healthy organizational cultures and importance of sense of collaboration and community e. identify behaviours that affect physical and mental health |
| A-1.03.02L | demonstrate knowledge of techniques to manage personal health and well-being | <ul style="list-style-type: none"> a. describe stress and time management techniques b. identify supports to manage personal health and well-being c. describe techniques to manage health and wellness |
| A-1.03.03L | demonstrate knowledge of professionalism and professional ethics | <ul style="list-style-type: none"> a. identify characteristics and purpose of professionalism and professional ethics b. describe factors that impact professionalism c. identify elements of codes of ethics, codes of conduct and other professional standards, and describe their characteristics and applications |
| A-1.03.04L | demonstrate knowledge of value of diversity, equity, inclusion and belonging in workplace | <ul style="list-style-type: none"> a. define diversity and differences between individuals b. define equity and importance of individual's access to same opportunities and resources c. define inclusion and creation of respectful work environments d. identify conduct that constitutes harassment and discrimination |

Range of Variables (include, but not limited to)

| | |
|---|---|
| behaviours | diet, fitness, sleep, managing stress and emotions |
| techniques to manage health and wellness | practicing techniques for remaining physically, mentally and emotionally “fit for work”, managing personal and work life, recognizing the effects and consequences of alcohol, over-the-counter drugs, prescription drugs or illegal drugs before, during and after work, using personal hygiene habits |
| professional ethics | personal and/or corporate standards of behavior expected by professionals, values and guiding principles to guide individuals in performing job functions |
| factors | presentation of self (appearance, hygiene), communication (verbal, written, body language, social media profile), conduct |
| elements of codes of ethics, codes of conduct and other professional standards | professional obligations, signals accountability to the public, maintain public trust and credibility of the profession, defines misconduct |
| harassment | as defined by the Canadian and jurisdictional Human Rights Commissions |
| discrimination | as defined by the Canadian Human Rights Act and jurisdictional human rights laws |

Task A-2 Uses and maintains tools and equipment

Task Descriptor

Ironworkers (structural/ornamental) use a wide variety of tools and equipment to carry out their daily tasks. Tools and equipment must be used, maintained and stored in a safe manner. A list of the tools and equipment used in this trade is found in Appendix B – Tools and Equipment

A-2.01 Uses hand tools and measuring tools

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-2.01.01P | select and use hand tools and measuring tools | hand tools and measuring tools are selected and used according to task and manufacturers' specifications |
| A-2.01.02P | inspect and identify damaged, worn or unsafe hand tools and measuring tools, and remove from service | inspection is performed, and damaged, worn or unsafe hand tools and measuring tools are identified and removed from service according to manufacturers' specifications, and company policies and procedures |
| A-2.01.03P | clean, maintain and store hand tools and measuring tools | hand tools and measuring tools are cleaned, maintained and stored according to manufacturers' specifications, and company policies and procedures |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-2.01.01L | demonstrate knowledge of hand tools and measuring tools, their characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of hand tools, and describe their characteristics and applications b. describe operating principles of hand tools c. identify types of measuring tools, and describe their characteristics and applications d. describe operating principles of measuring tools e. interpret information pertaining to hand tools and measuring tools found in manufacturers' specifications |
| A-2.01.02L | demonstrate knowledge of procedures to use and maintain hand tools and measuring tools | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining hand tools and measuring tools b. describe procedures to inspect, identify and remove damaged, worn or unsafe hand tools and measuring tools from service c. describe procedures to clean, maintain and store hand tools and measuring tools d. describe procedures to dispose of damaged hand tools and measuring tools |

Range of Variables (include, but not limited to)

| | |
|----------------|--|
| hazards | flying debris, pinch/crush points, dropped tools, cuts, punctures, overexertion, struck by tools, repetitive motions |
|----------------|--|

A-2.02 Uses power tools

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-2.02.01P | select and use power tools | power tools are selected and used according to task and manufacturers' specifications |
| A-2.02.02P | inspect and identify damaged, worn or unsafe power tools, and remove from service | inspection is performed, and damaged, worn or unsafe power tools are identified and removed from service according to manufacturers' specifications, and company policies and procedures |
| A-2.02.03P | clean, maintain and store power tools | power tools are cleaned, maintained and stored according to manufacturers' specifications, and company policies and procedures |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-2.02.01L | demonstrate knowledge of power tools, their characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of power tools, and describe their characteristics and applications b. identify types of power sources, and describe their characteristics and applications c. describe operating principles of power tools d. interpret information pertaining to power tools found in specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.02.02L | demonstrate knowledge of procedures to use and maintain power tools | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining power tools b. describe procedures to inspect, identify and repair or remove damaged, worn or unsafe power tools from service c. describe procedures to clean, maintain and store power tools d. describe procedures to calibrate power tools e. describe procedures to dispose of damaged power tools |
| A-2.02.03L | demonstrate knowledge of training and certification requirements to use and maintain power tools | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain power tools |
| A-2.02.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining power tools | <ul style="list-style-type: none"> a. identify standards and regulations pertaining to using and maintaining power tools |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| types of power sources | pneumatic, electric, gas, hydraulic, mechanical, powder actuated, battery |
| hazards | flying debris, pinch/crush points, dropped tools, cuts, punctures, overexertion, struck by tools, electrocution, pressures (air, hydraulic), repetitive motions, environmental conditions |

A-2.03 Uses powder-actuated tools

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-2.03.01P | select and use powder-actuated tools and components | powder-actuated tools and components are selected and used according to task and manufacturers' specifications |
| A-2.03.02P | select and use powder-actuated charges and fasteners | powder-actuated charges and fasteners are selected and used according to task and manufacturers' specifications |
| A-2.03.03P | inspect and identify damaged, worn or unsafe powder-actuated tools, and remove from service | inspection is performed, and damaged, worn or unsafe powder-actuated tools are identified and removed from service according to manufacturers' specifications, and company policies and procedures |
| A-2.03.04P | clean and lubricate powder-actuated tools | powder-actuated tools are cleaned and lubricated according to manufacturers' recommendations and specifications |
| A-2.03.05P | store and secure powder-actuated tools and charges | powder-actuated tools and charges are stored and secured according to manufacturers' recommendations and specifications, jurisdictional regulations, and company policies and procedures |
| A-2.03.06P | maintain powder-actuated tools | powder-actuated tools are maintained according to manufacturers' recommendations and specifications, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|-------------------|--------------------------------|
| components | piston, pin, trigger, magazine |
|-------------------|--------------------------------|

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-2.03.01L | demonstrate knowledge of powder-actuated tools, charges and fasteners, their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of powder-actuated tools and their charges, fasteners and components, and describe their characteristics and applications b. describe operating principles of powder-actuated tools c. interpret information pertaining to powder-actuated tools found in specifications |
| A-2.03.02L | demonstrate knowledge of procedures to use and maintain powder-actuated tools | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining powder-actuated tools b. describe procedures to inspect, identify and remove damaged, worn or unsafe powder-actuated tools from service c. describe procedures to clean and lubricate powder-actuated tools d. describe procedures to store and secure powder-actuated tools e. describe procedures to maintain powder-actuated tools f. describe procedures to test powder-actuated tools g. describe procedures to dispose of charges for powder-actuated tools |
| A-2.03.03L | demonstrate knowledge of training and certification requirements to use and maintain powder-actuated tools | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain powder-actuated tools |
| A-2.03.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining powder-actuated tools | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to using and maintaining powder-actuated tools |

Range of Variables (include, but not limited to)

| | |
|-------------------|---|
| components | piston, pin, trigger, magazine |
| hazards | blow-through, ricochet, noise, flying debris, pinch/crush points, punctures, overexertion, working at heights |

A-2.04 Uses mobile elevating work platforms (MEWP)

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-2.04.01P | select mobile elevating work platforms (MEWPs) and accessories | MEWPs and accessories are selected according to task and manufacturers' specifications |
| A-2.04.02P | ensure certifications for safety and operation of MEWPs are up-to-date | certifications to operate MEWPs are up-to-date according to jurisdictional regulations and company policies |
| A-2.04.03P | inspect and identify damaged, worn or unsafe MEWPs and accessories , and remove from service | inspection is performed prior to use, and damaged, worn or unsafe MEWPs and accessories are identified and removed from service according to jurisdictional regulations, manufacturers' specifications, and company policies and procedures |
| A-2.04.04P | position MEWPs | MEWPs are positioned according to task, manufacturers' specifications and site conditions |
| A-2.04.05P | use MEWPs | MEWPs are used according to manufacturers' specifications, site-specific requirements, jurisdictional regulations, and company policies and procedures |
| A-2.04.06P | store MEWPs | MEWPs are stored according to manufacturers' specifications, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|-----------------------|---|
| A-2.04.07P | maintain MEWPs | MEWPs are maintained according to manufacturers' recommendations and specifications, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|--------------------|--|
| MEWPs | electric, internal combustion engine (gas, diesel, LPG [liquid propane gas]), power vertical (scissor lift), on-slab and off-slab type, boom supported, articulated, straight boom |
| accessories | on-board AC power, mounted welders, extendable platforms, lifting attachments, air lines |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-2.04.01L | demonstrate knowledge of MEWPs , their components, accessories , characteristics, applications, and operation | <ul style="list-style-type: none"> a. identify types of MEWPs and their components and accessories, and describe their characteristics and applications b. describe operating principles of MEWPs c. interpret information pertaining to MEWPs found in manufacturers' specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-2.04.02L | demonstrate knowledge of procedures to use and maintain MEWPs | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using MEWPs b. describe procedures to inspect, identify and remove damaged, worn or unsafe MEWPs and accessories from service c. describe procedures to position MEWPs worn d. describe procedures to use MEWPs e. describe procedures to store MEWPs f. describe procedures to maintain MEWPs |
| A-2.04.03L | demonstrate knowledge of training and certification requirements to use and maintain MEWPs | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain MEWPs |
| A-2.04.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining MEWPs | <ul style="list-style-type: none"> a. identify standards and regulations pertaining to using and maintaining MEWPs |

Range of Variables (include, but not limited to)

| | |
|-----------------------------------|---|
| MEWPs | electric, internal combustion engine (gas, diesel, LPG [liquid propane gas]), power vertical (scissor lift), on-slab and off-slab type, boom supported, articulated, straight boom |
| accessories | on-board AC power, mounted welders, extendable platforms, lifting attachments, air lines |
| hazards | tipping, crush/pinch points, equipment overloaded, electrocution, injuries from equipment, falls from heights, unstable and changing ground conditions, environmental conditions, tripping, falling objects |
| training and certification | fall protection, equipment-specific operator, powerline hazard (in some jurisdictions) |

A-2.05 Uses material handling equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| A-2.05.01P | select material handling equipment and components | material handling equipment and components are selected according to task and manufacturers' specifications |
| A-2.05.02P | ensure certifications for safety and operation of material handling equipment are up-to-date | certifications for safety and to operate material handling equipment are up-to-date according to jurisdictional regulations and company policies |
| A-2.05.03P | inspect and identify damaged, worn or unsafe material handling equipment , and remove from service | inspection is performed prior to use, and damaged, worn or unsafe material handling equipment is identified and removed from service according to manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| A-2.05.04P | position material handling equipment | material handling equipment is positioned according to task, manufacturers' specifications and site conditions |
| A-2.05.05P | use material handling equipment | material handling equipment is used according to manufacturers' specifications, site-specific requirements and jurisdictional regulations |
| A-2.05.06P | store material handling equipment | material handling equipment is stored according to manufacturers' specifications, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-2.05.07P | maintain material handling equipment | material handling equipment is maintained according to manufacturers' recommendations and specifications, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|------------------------------------|---|
| material handling equipment | forklifts (all classes) including high capacity, telehandlers, panel or glass lifting equipment, rolling hydraulic gantry systems, 0–8-ton industrial crane |
| components | winch, claps, various attachment street cleaner, motivation boom, fork extensions, personnel platform, spreader beams |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-2.05.01L | demonstrate knowledge of material handling equipment , their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of material handling equipment and their components, and describe their characteristics and applications b. describe operating principles of material handling equipment c. interpret information pertaining to material handling equipment found in manufacturers' specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.05.02L | demonstrate knowledge of procedures to use and maintain material handling equipment | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using material handling equipment b. describe procedures to inspect, identify and remove damaged, worn or unsafe material handling equipment from service c. describe procedures to position material handling equipment d. describe procedures to use material handling equipment e. describe procedures to store material handling equipment f. describe procedures to maintain material handling equipment |
| A-2.05.03L | demonstrate knowledge of training and certification requirements to use and maintain material handling equipment | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain material handling equipment |
| A-2.05.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining material handling equipment | <ul style="list-style-type: none"> a. identify standards and regulations pertaining to use and maintenance of material handling equipment |

Range of Variables (include, but not limited to)

| | |
|------------------------------------|---|
| material handling equipment | forklifts (all classes) including high capacity, telehandlers, panel or glass lifting equipment, rolling hydraulic gantry systems, 0–8-ton industrial crane |
| components | winch, claps, various attachment street cleaner, motivation boom, fork extensions, personnel platform, spreader beams |
| hazards | tipping, crush/pinch points, equipment overloaded, electrocution, injuries from equipment, injuries from load, falls from heights, unstable and changing ground conditions, environmental conditions, equipment failure, operator error |
| training and certification | equipment-specific operator, powerline hazard (in some jurisdictions), jurisdiction specific |

A-2.06 Uses ladders

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-2.06.01P | select and use ladders and components | ladders and components are selected and used according to task, manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| A-2.06.02P | inspect and identify worn damaged or unsafe ladders , and remove from service | inspection is performed before and after use, and worn damaged or unsafe ladders are identified and removed from service according to site-specific requirements, manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| A-2.06.03P | position ladders | ladders are positioned according to task, jurisdictional regulations, and company policies and procedures |
| A-2.06.04P | secure ladders | ladders are secured according to task, jurisdictional regulations, and company policies and procedures |
| A-2.06.05P | store ladders | ladders are stored according to manufacturers' specifications, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| ladders | extension, step, fixed, rolling, platform |
| components | cleats, pawls, pull rope, rungs, rails, pulleys, extensions, safety cages |
| safe work practices | maintaining three-point contact rule, avoiding over-reaching, setting up safely, securing ladders, allowing three feet above landing for access or egress, remain below top two rungs of step ladder |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-2.06.01L | demonstrate knowledge of ladders , their components , characteristics , applications and operation | <ul style="list-style-type: none"> a. identify types of ladders and their components, and describe their characteristics and applications b. describe operating principles of ladders and their components c. interpret information pertaining to ladders found in manufacturers' specifications |
| A-2.06.02L | demonstrate knowledge of procedures to use and maintain ladders and their components | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using ladders b. describe procedures to inspect, identify and remove damaged or unsafe ladders from service c. describe procedures to position and secure ladders d. describe procedures to store ladders e. explain three-point contact when using ladders |
| A-2.06.03L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining ladders | <ul style="list-style-type: none"> a. identify standards, and site-specific and jurisdictional regulations pertaining to using and maintaining ladders |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| ladders | extension, step, fixed, rolling, platform |
| components | cleats, pawls, pull rope, rungs, rails, pulleys, extensions, safety cages |
| characteristics | conductive, non-conductive, grade/class, capacities, height requirements |
| hazards | overloads, pinch/crush points, falls from heights, electrocution, environmental conditions, unstable and changing ground conditions |
| safe work practices | maintaining three-point contact rule, avoiding over-reaching, setting up safely, securing ladders, allowing three feet above landing for access or egress, remain below top two rungs of step ladder |

A-2.07 Uses scaffolding

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-2.07.01P | select and use scaffolding and components | scaffolding and components are selected and used according to task, and engineering and manufacturers' specifications |
| A-2.07.02P | inspect and identify damaged, worn or unsafe scaffolding and components , and remove from service | inspection is performed prior to use and on an ongoing basis, and damaged, worn or unsafe scaffolding and components are identified and removed from service according to site-specific requirements, engineering and manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| A-2.07.03P | position, erect, level and plumb scaffolding and install components | scaffolding is positioned, erected, levelled and plumbed, and components are installed according to manufacturers' specifications, jurisdictional regulations and site-specific requirements |
| A-2.07.04P | secure scaffolding and components | scaffolding and components are secured according to scaffold design, engineering and manufacturers' specifications, and jurisdictional regulations |
| A-2.07.05P | dismantle and store scaffolding and components | scaffolding and components are dismantled and stored according to scaffold design, engineering and manufacturers' specifications, jurisdictional regulations, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|-------------------|--|
| components | planking, guardrails, toe plates, tie-ins, bracing, cantilevered sections, end frames, ledgers, bearers, screw jacks, wheels, casters, clamps, sills, fixed ladders, swing gates, access hatches |
|-------------------|--|

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-2.07.01L | demonstrate knowledge of scaffolding, their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of scaffolding and their components, and describe their characteristics and applications b. describe operating principles and limitations of scaffolding and their components c. interpret information pertaining to scaffolding and their components found on drawings and specifications |
| A-2.07.02L | demonstrate knowledge of procedures to use and maintain scaffolding and their components | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining scaffolding b. describe procedures to maintain scaffolding c. describe procedures to inspect, identify and remove damaged worn or unsafe scaffolding and their components from service d. describe procedures to position, erect, level, plumb and secure scaffolding and their components |
| A-2.07.03L | demonstrate knowledge of training and certification requirements to use and maintain scaffolding | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain scaffolding |
| A-2.07.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining scaffolding | <ul style="list-style-type: none"> a. identify standards and regulations pertaining to using and maintaining scaffolding |

Range of Variables (include, but not limited to)

| | |
|-------------------|---|
| components | planking, guardrails, toe plates, tie-ins, bracing, cantilevered sections, end frames, ledgers, bearers, screw jacks, wheels, casters, clamps, sills, fixed ladders, swing gates, access hatches |
| hazards | overloads, pinch/crush points, falls from heights, electrocution, overhead obstructions, air quality in hoarded scaffolding, unstable and changing ground conditions, environmental conditions, falling objects |

A-2.08 Uses surveying equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-2.08.01P | select and use surveying equipment | surveying equipment is selected and used according to task and manufacturers' specifications |
| A-2.08.02P | set up and check calibration on surveying equipment | surveying equipment is set up, checked and calibrated according to manufacturers' specifications to ensure accuracy |
| A-2.08.03P | calculate angles and distances | angles and distances are calculated according to drawings and task requirements |
| A-2.08.04P | lay out drawing information on site | drawing information is laid out on site |
| A-2.08.05P | verify plumbing and alignment of structure | plumbing and alignment of structure is verified according to drawings and required tolerances |
| A-2.08.06P | store and secure surveying equipment | surveying equipment is stored and secured according to manufacturers' specifications, and company policies and procedures |
| A-2.08.07P | maintain surveying equipment | surveying equipment is maintained according to manufacturers' specifications |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| surveying equipment | theodolite/transit, spirit levels, laser levels, builders' levels/dumpy, total stations, electronic distance measuring (EDM) tools, tape measures, survey chains, leveling rods, plumb bobs, tripods |
|----------------------------|--|

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|---|---|
| A-2.08.01L | demonstrate knowledge of surveying equipment , their characteristics , applications and operation | <ul style="list-style-type: none"> a. identify types of surveying equipment, and describe their characteristics and applications b. describe operating principles of surveying equipment c. interpret information pertaining to measurements found on drawings and specifications |
| A-2.08.02L | demonstrate knowledge of procedures to use surveying equipment | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using surveying equipment b. describe measurement techniques and use of offsets c. describe procedures to interpret and layout drawing information d. describe marking techniques e. describe procedures to set up and check calibration of surveying equipment f. describe procedures and methods to plumb and align structures g. describe procedures to maintain surveying equipment |
| A-2.08.03L | demonstrate knowledge of training requirements to use surveying equipment | <ul style="list-style-type: none"> a. identify training requirements to use surveying equipment |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| surveying equipment | theodolite/transit, spirit levels, laser levels, builders' levels/dumpy, total stations, electronic distance measuring (EDM) tools, tape measures, survey chains, leveling rods, plumb bobs, tripods |
| characteristics | delicate, fragile, expensive, sensitivity to environmental conditions |
| hazards | lasers, magnified visible spectrum lights, infrared radiation, ultraviolet radiation, pinch/crush points |

A-2.09 Uses welding equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-2.09.01P | select and use welding equipment, components and consumables | welding equipment, components and consumables are selected and used according to task and manufacturers' specifications |
| A-2.09.02P | set up welding equipment | welding equipment is set up according to task and manufacturers' specifications |
| A-2.09.03P | inspect and identify damaged, worn or unsafe welding equipment and components , and repair or remove from service | inspection is performed, and damaged, worn or unsafe welding equipment and components are identified, and repaired or removed from service according to manufacturers' specifications, and company policies and procedures |
| A-2.09.04P | perform welding processes | welding processes are performed according to codes, standards, task requirements and welding procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| A-2.09.05P | adjust welding parameters | welding parameters are adjusted according to task requirements, manufacturers' specifications, codes and welding procedures |
| A-2.09.06P | store welding equipment, components and consumables | welding equipment, components and consumables are stored according to codes |

Range of Variables (include, but not limited to)

| | |
|--------------------------|--|
| components | welding rod oven, welding cable, work clamps, electrode holder, guns, liners, remotes, compressed gas cylinders |
| consumables | electrodes, wires, gases, contact tips, fillers |
| welding processes | shielded metal arc welding (SMAW), flux core arc welding (FCAW), gas metal arc welding (GMAW), gas tungsten arc welding (GTAW) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.09.01L | demonstrate knowledge of welding equipment, their components , consumables , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of welding equipment and their components and consumables, and describe their characteristics and applications b. describe operating principles of welding equipment and their components and consumables c. interpret information and symbols pertaining to welding found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.09.02L | demonstrate knowledge of procedures to use and maintain welding equipment | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining welding equipment b. describe welding processes, procedures and techniques c. describe possible welding discontinuities and defects d. describe procedures to maintain welding equipment e. describe procedures to inspect, identify and remove damaged, worn or unsafe welding equipment and components from service f. describe procedures to test welding equipment g. describe procedures to store welding equipment and their components and consumables |
| A-2.09.03L | demonstrate knowledge of training and certification requirements to use and maintain welding equipment | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain welding equipment |
| A-2.09.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining welding equipment | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to using and maintaining welding equipment |

Range of Variables (include, but not limited to)

| | |
|--------------------|---|
| components | welding rod oven, welding cable, work clamps, electrode holder, guns, liners, remotes, compressed gas cylinders |
| consumables | electrodes, wires, gases, contact tips, fillers |
| hazards | electrocution, burns, arc flash, radiation, explosions, fires, respiratory particulates, heavy metals |

| | |
|---|--|
| welding processes | shielded metal arc welding (SMAW), flux core arc welding (FCAW), gas metal arc welding (GMAW), gas tungsten arc welding (GTAW) |
| defects | porosity, undercut, fusion, inclusions, overlap |
| codes, standards and regulations | Canadian Welding Bureau (CWB), Canadian Standards Association (CSA), jurisdictional |

A-2.10 Uses mechanical cutting equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-2.10.01P | select and use mechanical cutting equipment and components | mechanical cutting equipment and components are selected and used according to task, manufacturers' specifications, and company policies and procedures |
| A-2.10.02P | set up mechanical cutting equipment | mechanical cutting equipment and components are set up according to task and manufacturers' specifications |
| A-2.10.03P | inspect and identify damaged, worn or unsafe mechanical cutting equipment and components , and repair or remove from service | inspection is performed, and damaged, worn or unsafe mechanical cutting equipment and components are identified and repaired or removed from service according to manufacturers' specifications, and company policies and procedures |
| A-2.10.04P | adjust cutting parameters | cutting parameters are adjusted according to task requirements, manufacturers' specifications, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-2.10.05P | store and secure mechanical cutting equipment and components | mechanical cutting equipment and components are stored and secured according to manufacturers' specifications, and company policies and procedures |
| A-2.10.06P | maintain mechanical cutting equipment and components | mechanical cutting equipment and components are maintained according to manufacturers' specifications, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|-------------------------------------|---|
| mechanical cutting equipment | electric cut-off saws, portable band saws, gas and battery powered quick-cut saws, angle grinders (zip cuts), reciprocating saws, power shears, nibblers, low-speed high-torque circular saws, magnetic drills, core drills, pipe cutters |
| components | blades, guards, handles, cords, lubrication systems, core bits, annular cutters, twist drills, reamers, taps and dies |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.10.01L | demonstrate knowledge of mechanical cutting equipment , their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of mechanical cutting equipment and components, and describe their characteristics and applications b. describe operating principles of mechanical cutting equipment c. interpret information pertaining to mechanical cutting equipment, and their components found in specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.10.02L | demonstrate knowledge of procedures to use and maintain mechanical cutting equipment and their components | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining mechanical cutting equipment and their components b. describe procedures to inspect, identify and remove damaged, worn or unsafe mechanical cutting equipment and components from service c. describe procedures to store and secure mechanical cutting equipment and components d. describe procedures to maintain mechanical cutting equipment and components |
| A-2.10.03L | demonstrate knowledge of training and certification requirements to use and maintain mechanical cutting equipment | <ul style="list-style-type: none"> a. identify training and certification requirements to use and maintain mechanical cutting equipment |
| A-2.10.04L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining mechanical cutting equipment | <ul style="list-style-type: none"> a. identify standards and regulations pertaining to using and maintaining mechanical cutting equipment |

Range of Variables (include, but not limited to)

| | |
|-------------------------------------|---|
| mechanical cutting equipment | electric cut-off saws, portable band saws, gas and battery powered quick-cut saws, angle grinders (zip cuts), reciprocating saws, power shears, nibblers, low-speed high-torque circular saws, magnetic drills, core drills, pipe cutters |
| components | blades, guards, handles, cords, lubrication systems, core bits, annular cutters, twist drills, reamers, taps and dies |
| hazards | cuts, noise, electrocution, burns, entanglement, pinch/crush points, dropping tools, flying debris, sparks, combustibles, respiratory particulates, airborne irritants |

A-2.11 Uses thermal cutting equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| A-2.11.01P | select and use thermal cutting equipment, components and consumables | thermal cutting equipment, components and consumables are selected and used according to task and manufacturers' specifications |
| A-2.11.02P | set up thermal cutting equipment and components | thermal cutting equipment and components are set up according to task and manufacturers' specifications |
| A-2.11.03P | inspect and identify damaged, worn or unsafe thermal cutting equipment and components , and repair or remove from service | inspection is performed, and damaged, worn or unsafe thermal cutting equipment and components are identified, and repaired or removed from service according to manufacturers' specifications, and company policies and procedures |
| A-2.11.04P | perform cutting and gouging processes | cutting and gouging processes are performed according to task requirements, industry standards, welding procedures, and company policies and procedures |
| A-2.11.05P | adjust cutting and gouging parameters | cutting and gouging parameters are adjusted according to task requirements, welding procedures, and company policies and procedures |
| A-2.11.06P | store thermal cutting equipment, components and consumables | thermal cutting equipment, components and consumables are stored according to site-specific requirements, jurisdictional regulations and codes, manufacturers' specifications, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-2.11.07P | maintain thermal cutting equipment and components | thermal cutting equipment and components are maintained according to manufacturers' specifications, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|--------------------|---|
| consumables | electrodes, gouging rods, lances/rods, compressed gases, contact tips |
| components | welding cable, work clamps, torches, compressed gas cylinders, compressed air, air lines, hoses, regulators, check valves, torch tips |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-2.11.01L | demonstrate knowledge of thermal cutting equipment, their components, consumables , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of thermal cutting equipment and their components and consumables, and describe their characteristics and applications b. describe operating principles of thermal cutting equipment, and their components and consumables c. interpret information pertaining to thermal cutting equipment, and their components and consumables found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-2.11.02L | demonstrate knowledge of procedures to use and maintain thermal cutting equipment | <ul style="list-style-type: none"> a. identify hazards, and describe safe work practices pertaining to using and maintaining thermal cutting equipment, and their components and consumables b. describe cutting and gouging processes, procedures and techniques c. describe possible cutting defects d. describe procedures to maintain thermal cutting equipment and their components e. describe procedures to inspect, identify and remove damaged, worn or unsafe thermal cutting equipment and components from service f. describe procedures to store thermal cutting equipment, and their components and consumables |
| A-2.11.03L | demonstrate knowledge of regulatory requirements pertaining to using and maintaining thermal cutting equipment | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to using and maintaining thermal cutting equipment |

Range of Variables (include, but not limited to)

| | |
|---|---|
| components | welding cable, work clamps, torches, compressed gas cylinders, compressed air, air lines, hoses, regulators, check valves, torch tips |
| consumables | electrodes, gouging rods, lances/rods, compressed gases, contact tips |
| types of thermal cutting equipment | thermal lance, oxy-fuel, plasma, carbon arc gouging |
| hazards | electrocution, burns, arc flash, radiation, respiratory particulates, noise, explosions, fires, compressed gases |
| codes, standards and regulations | Canadian Welding Bureau (CWB), Canadian Standards Association (CSA), jurisdictional |

Task A-3 Organizes work

Task Descriptor

Ironworkers (structural/ornamental) organize their work including materials and supplies. They perform layout and use drawings and documentation to plan and complete their work tasks. Ironworkers (structural/ornamental) update documents to track and monitor their work. They ensure their work is done safely and according to project design by following drawings, regulations, specifications, processes and procedures, and participating in quality control practices.

Ironworkers (structural/ornamental) must develop the ability to continuously do quality control checks to ensure compliance with specifications and regulatory requirements.

A-3.01 Organizes materials and supplies

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| A-3.01.01P | inspect and verify delivered materials | materials are inspected and verified to detect shipping damage and to ensure they conform to order according to shipping documentation, and company policies and procedures |
| A-3.01.02P | select and use tools and equipment | tools and equipment are selected and used according to task |
| A-3.01.03P | manually lift materials, supplies and equipment | materials, supplies and equipment are manually lifted according to OHS regulations, industry standards, and company policies and procedures to avoid personal injury, and damage to materials, supplies and equipment |

| Reference Code | Performance Criteria | Evidence of Attainment |
|-----------------------|---|---|
| A-3.01.04P | mechanically lift materials, supplies and equipment | materials, supplies and equipment are mechanically lifted using rigging, hoisting and positioning equipment according to manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| A-3.01.05P | unload and sort materials and supplies | materials and supplies are unloaded and sorted according to manufacturers' specifications, drawings and site-specific requirements |
| A-3.01.06P | place materials and supplies | materials and supplies are placed according to drawings, and company policies and procedures |
| A-3.01.07P | secure materials and supplies | materials and supplies are secured when being stored or shipped according to jurisdictional regulations, manufacturers' specifications and site conditions |
| A-3.01.08P | label materials and supplies | materials and supplies are labelled for project according to company policies and procedures, and jurisdictional regulations |
| A-3.01.09P | store materials and supplies | materials and supplies are stored to prevent damage, deterioration, displacement, discharge or theft according to jurisdictional regulations, manufacturers' specifications, and company policies and procedures |
| A-3.01.10P | dispose of waste materials | waste materials are disposed of according to jurisdictional regulations, and company policies and procedures |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|---|
| A-3.01.01L | demonstrate knowledge of materials and supplies, their characteristics and applications | <ul style="list-style-type: none"> a. identify materials and supplies, and describe their characteristics and applications, and identification requirements b. identify shipping documents, and describe their characteristics and applications c. describe product specific storage and handling principles d. describe information pertaining to materials and supplies found on drawings and specifications |
| A-3.01.02L | demonstrate knowledge of procedures to organize materials and supplies | <ul style="list-style-type: none"> a. identify tools and equipment used to organize materials and supplies, and describe their procedures for use, capabilities and limitations b. identify hazards, and describe safe work practices pertaining to unloading and organizing materials and supplies c. identify sources of information relevant to handling materials and supplies d. describe considerations for handling materials and supplies e. describe principles and procedures to organize materials and supplies, and site preparation f. describe procedures to inspect materials and supplies g. describe placement sequence h. describe procedures to dispose of and recycle materials and supplies |
| A-3.01.03L | demonstrate knowledge of training and certification requirements to organize materials and supplies | <ul style="list-style-type: none"> a. identify training and certification requirements to organize materials and supplies |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-3.01.04L | demonstrate knowledge of regulatory requirements pertaining to storing, handling and transporting of materials and supplies | a. identify codes, standards and regulations pertaining to storing, handling and transporting of materials and supplies b. identify and interpret regulatory requirements and responsibilities for disposing of waste materials |

Range of Variables (include, but not limited to)

| | |
|----------------|---|
| hazards | falls, pinch, crush, moving equipment, unstable materials, hazardous materials, overloading, environmental conditions |
|----------------|---|

A-3.02 Performs layout

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-3.02.01P | interpret drawings | drawings are interpreted to visualize finished product and to obtain measurements for layout |
| A-3.02.02P | select and use measuring devices and layout tools | measuring devices and layout tools are selected and used according to task and manufacturers' specifications |
| A-3.02.03P | apply marking and layout techniques | marking and layout techniques are applied according to drawing information and task requirements |
| A-3.02.04P | transfer drawing information to application | drawing information is transferred to application |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-3.02.01L | demonstrate knowledge of procedures to perform layout | a. interpret information to perform layout found on drawings and specifications b. identify measuring devices and layout tools used to perform layout, and describe their procedures for use c. identify hazards, and describe safe work practices pertaining to performing layout d. describe procedures to perform layout |
| A-3.02.02L | demonstrate knowledge of regulatory requirements pertaining to performing layout | a. identify codes, standards and regulations pertaining to performing layout |

A-3.03 Uses drawings and documentation

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|------------------------------------|---|
| A-3.03.01P | interpret drawing symbols | drawing symbols are interpreted |
| A-3.03.02P | correlate types of drawings | types of drawings are correlated according to order of importance and most current revisions |
| A-3.03.03P | distinguish types of views | types of views are distinguished |
| A-3.03.04P | relate drawings to worksite | drawings are related to worksite according to orientation and sequence of project |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-3.03.05P | apply project specifications and procedures | project specifications and procedures are applied according to jobsite documents, task requirements and sequence of project |
| A-3.03.06P | determine installation procedures and requirements | installation procedures and requirements are determined according to task, manufacturers' specifications, and drawings and documentation |
| A-3.03.07P | verify detailed equipment information | detailed equipment information is verified by referring to documentation |
| A-3.03.08P | maintain log sheets | log sheets are maintained according to jurisdictional regulations, manufacturers' specifications, site-specific requirements, and company policies and procedures |
| A-3.03.09P | complete written and electronic documents | written and electronic documents are completed according to jurisdictional regulations, site-specific requirements, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|--|---|
| drawings | blueprints, sketches, structural, structural erection, architectural, engineered, detail, erection, precast shop, shop, fabrication, weld procedures, Building Information Modeling (BIM) |
| types of views | plan, elevation, sections and details, 3-D, orthographic (e.g., plan, elevation, sections, details), isometric, oblique, perspective |
| project specifications and procedures | assembling, welding, positioning, hoisting, tensioning, grouting, erection |

| | |
|---|--|
| documentation | manufacturers' specifications, engineering specifications, manufacturers' and wholesaler catalogues, drawings, employer-specific forms and reports, material take-offs, weld procedures, calibration records, change orders, request for information (RFI), warranties |
| log sheets | repairs, inspections, maintenance, equipment, operator |
| written and electronic documents | work reports, work orders, incident reports, permits, time sheets, estimates Quality Assurance (QA) reports, requests for information RFI, extra work order (EWO), change order/change directives |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-3.03.01L | demonstrate knowledge of drawings and drafting techniques, their characteristics and applications | a. identify types of drawings , and describe their characteristics and applications b. identify types of views c. interpret symbols found on drawings and specifications d. identify abbreviations and technical vocabulary e. describe drafting techniques |
| A-3.03.02L | demonstrate knowledge of reference material and documentation , their purpose, application and use | a. identify types and sources of reference material and documentation , and describe their purpose and applications b. describe procedures to access, interpret and apply information found in reference material and documentation |
| A-3.03.03L | demonstrate knowledge of procedures to complete and interpret documentation and written and electronic documents | a. describe procedures to complete documentation and written and electronic documents |
| A-3.03.04L | demonstrate knowledge of regulatory requirements pertaining to trade | a. identify codes, standards and regulations pertaining to trade |

Range of Variables (include, but not limited to)

| | |
|-----------------|---|
| drawings | blueprints, sketches, structural, structural erection, architectural, engineered, detail, erection, precast shop, shop, fabrication, weld procedures, Building Information Modeling (BIM) |
|-----------------|---|

| | |
|---|--|
| types of views | plan, elevation, sections and details, 3-D, orthographic (e.g., plan, elevation, sections, details), isometric, oblique, perspective |
| symbols | welding, drafting, conveyor, revision |
| documentation | manufacturers' specifications, engineering specifications, manufacturers' and wholesaler catalogues, drawings, employer-specific forms and reports, material take-offs, weld procedures, calibration records, change orders, request for information (RFI), warranties |
| written and electronic documents | work reports, work orders, incident reports, permits, time sheets, estimates Quality Assurance (QA) reports, requests for information RFI, extra work order (EWO), change order/change directives |
| standards | CSA, CWB, ANSI, ASTM, Canadian Institute of Steel Construction (CISC) |
| regulations | OHS, WHMIS, building codes |

A-3.04 Plans tasks

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-3.04.01P | interpret specifications and drawings | specifications and drawings are interpreted |
| A-3.04.02P | select and inspect materials, supplies and equipment | materials, supplies and equipment are selected and inspected to ensure they are not damaged |
| A-3.04.03P | perform scheduling of materials, supplies and equipment required for task | materials, supplies and equipment are scheduled according to task, documentation , jurisdictional regulations, TDG, site-specific requirements, and company policies and procedures |
| A-3.04.04P | revise and adjust scheduled tasks | scheduled tasks are revised and adjusted according to factors |
| A-3.04.05P | maintain schedule and develop contingency plan | schedule is maintained and contingency plan is developed according to factors |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-3.04.06P | apply for and obtain work permits | work permits are obtained according to site-specific requirements, jurisdictional regulations, and company policies and procedures |
| A-3.04.07P | coordinate work site access | work site access is coordinated according to site-specific requirements and to avoid downtime and delays |
| A-3.04.08P | schedule tasks with other trades, sectors and professionals | tasks with other trades, sectors and professionals are scheduled according to factors |
| A-3.04.09P | select and assign personnel | personnel are selected and assigned according to specific tasks, equipment and certifications |
| A-3.04.10P | plan organization and storage of tools and equipment on site | organization and storage of tools and equipment on site are planned according to task, site-specific requirements and jurisdictional regulations |

Range of Variables (include, but not limited to)

| | |
|--|--|
| scheduling | preparing material list, confirming availability, lead times, transport and delivery; ordering materials, supplies and equipment |
| documentation | manufacturers' specifications, engineering specifications, manufacturer and wholesaler catalogues, drawings, employer-specific forms and reports, material take-offs, weld procedures, calibration records |
| factors | environmental conditions, qualifications and availability of personnel, site conditions (e.g., delays in scope of work, access, laydown), delay of materials, supplies and personnel |
| work permits | hot work, confined space, limited access area entry, road closure, energized electrical equipment (e.g., power lines) |
| other trades, sectors and professionals | carpenters, surveyors, boilermakers, millwrights, fabricators, engineers, suppliers, equipment operators |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-3.04.01L | demonstrate knowledge of planning tasks and procedures | a. identify sources of information relevant to planning and execution b. interpret information pertaining to planning found on specifications and drawings c. identify information gathering and communication techniques, and describe their associated procedures d. describe procedures to perform scheduling of materials, supplies and equipment e. describe procedures to coordinate tasks and procedures f. describe procedures to estimate work requirements g. identify elements of a schedule |
| A-3.04.02L | demonstrate knowledge of regulatory requirements pertaining to trade | a. identify codes, standards and regulations pertaining to trade |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|--|
| sources of information | work permits, drawings, specifications, manufacturers' literature, code books, company policies and procedures, SDS, workplace hazards assessment report, on-site log sheets |
| scheduling | preparing material list, confirming availability, lead times, transport and delivery; ordering materials, supplies and equipment |
| elements of a schedule | critical path, time, date, priority, delays, milestones, contingency plans |
| standards | CSA, CWB, ANSI, ASTM, CISC |
| regulations | OHS, WHMIS |

Task A-4 Maintains continuous learning

Task Descriptor

Ironworkers (structural/ornamental) must stay current on building science principles, sustainable practices and emerging technologies being introduced in the trade. They need to keep informed about new types of equipment, materials, processes, procedures and techniques to work safely and more efficiently and increase productivity.

A-4.01 Upskills in new trade practices and procedures

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-4.01.01P | apply continuous learning methods | continuous learning methods are applied |
| A-4.01.02P | develop and maintain personal and professional development plan | personal and professional development plan is developed and maintained with established learning goals (short and long term) and time frames |
| A-4.01.03P | identify available supports and resources for learning | available supports and resources for learning are identified |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| supports and resources | professional networks and associations, manufacturers' seminars, collaboration with colleagues and community members, counselling, mentoring, peer support groups, online resources, Individual Education Plan (IEP), language supports, accommodations |
|-------------------------------|---|

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-4.01.01L | demonstrate knowledge of continuous learning in new trade practices and procedures | <ul style="list-style-type: none"> a. identify continuous learning methods b. describe importance of staying current on new trade practices and procedures c. identify supports and resources for learning |
| A-4.01.02L | demonstrate knowledge of personal and professional development plan | <ul style="list-style-type: none"> a. identify elements of a professional portfolio b. identify link between professionalism and continuous learning c. describe how to assess personal learning needs d. identify factors that may impact learning needs and goals |

Range of Variables (include, but not limited to)

| | |
|---|--|
| continuous learning methods | actively engaging in performance review processes and taking action to address feedback, seeking out and actively participating in and embracing learning opportunities (seminars, webinars, training courses, podcasts, independent research), maintaining all required certifications and training, upgrading and maintaining computer and technology skills, sharing learning outcomes and concepts with others, transferring knowledge into practice |
| supports and resources | professional networks and associations, manufacturers' seminars, collaboration with colleagues and community members, counselling, mentoring, peer support groups, online resources, Individual Education Plan (IEP), language supports, accommodations |
| elements of a professional portfolio | resume, certificates, licenses, diplomas, degrees, transcripts, marketable skills, professional accomplishments, work samples, awards, references |
| factors | new technology, trade and sector trends and practices, skills updating, legislative and regulatory changes, barriers to learning |

A-4.02 Upskills in emerging technologies

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-4.02.01P | read information about latest advancements and emerging technologies | information about latest advancements and emerging technologies is read to stay informed |
| A-4.02.02P | attend seminars, webinars and information sessions | seminars, webinars and information sessions organized by manufacturers, suppliers, unions and employers are attended |
| A-4.02.03P | share information with colleagues and management | information is shared with colleagues and management, and advantages and disadvantages are explained |

Range of Variables (include, but not limited to)

| | |
|--------------------|---|
| information | manufacturers' literature, online resources, trade journals and magazines, tradeshow, conferences |
|--------------------|---|

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| A-4.02.01L | demonstrate knowledge of continuous learning in emerging technologies | a. identify types of information on emerging technologies b. describe importance of staying current on emerging technologies |

Range of Variables (include, but not limited to)

| | |
|--------------------|---|
| information | manufacturers' literature, online resources, trade journals and magazines, tradeshow, conferences |
|--------------------|---|

Task A-5 Uses communication and mentoring techniques

Task Descriptor

Learning in the trades is done primarily in the workplace with tradespeople passing on their skills and knowledge to apprentices, as well as sharing knowledge among themselves. Apprenticeship is, and always has been about mentoring, which is learning workplace skills and passing them onto others. Because of the importance of this to the trade, this task covers the activities related to communication in the workplace and mentoring skills.

A-5.01 Uses communication techniques

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-5.01.01P | demonstrate communication techniques with individuals or in a group | instructions and messages are interpreted by all parties involved in communication |
| A-5.01.02P | listen using active listening practices | active listening practices are utilized |
| A-5.01.03P | speak clearly using correct industry terminology | understanding of message is confirmed by both parties |
| A-5.01.04P | receive and respond to instructions | response to instructions indicates understanding |
| A-5.01.05P | receive and respond to feedback on work completed or performed | response to feedback indicates understanding and corrective measures are taken |
| A-5.01.06P | explain and provide feedback | explanation and feedback are provided and task is carried out as directed |
| A-5.01.07P | communicate understanding and comfort level in performing trade tasks | opportunities for practice and gradual exposure to new tasks is offered and understanding is confirmed |
| A-5.01.08P | use questions to improve communication | questions are used to enhance understanding, on the job training and goal setting |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| A-5.01.09P | participate in safety and information meetings | meetings are attended, information is relayed to employees, and is applied |
| A-5.01.10P | send and receive electronic messages | electronic messages are sent and received using professionalism, plain language and clear statements according to company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|----------------------------|---|
| active listening | hearing, interpreting, reflecting, responding, paraphrasing |
| electronic messages | email, text messages |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|-------------------------------------|
| A-5.01.01L | demonstrate knowledge of trade terminology | a. define terminology used in trade |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| A-5.01.02L | demonstrate knowledge of effective communication practices | <ul style="list-style-type: none"> a. describe importance of using effective verbal and non-verbal communication with people in the workplace b. describe importance of teamwork c. identify sources of information d. identify communication and learning styles e. describe effective listening and speaking skills f. describe how to receive and give instructions effectively g. identify personal responsibilities and attitudes that contribute to on-the-job success h. identify value of equity, diversity and inclusion in workplace i. identify verbal and non-verbal communication that constitutes bullying, harassment and discrimination j. identify communication styles appropriate to different systems and applications of electronic messages |

Range of Variables (include, but not limited to)

| | |
|--------------------------------|---|
| people in the workplace | other tradespeople, colleagues, apprentices, supervisors, clients, jurisdictional representatives, manufacturers, office administrators |
| sources of information | regulations, codes, occupational health and safety requirements, jurisdictional regulations, blueprints, drawings, specifications, company and client documentation |
| learning styles | visual, auditory, kinesthetic |

| | |
|--|---|
| personal responsibilities and attitudes | asking questions, working safely, accepting constructive feedback, time management and punctuality, respect for authority, good stewardship of materials, tools and property, efficient work practice |
| harassment | as defined by the Canadian and jurisdictional Human Rights Commissions |
| discrimination | as defined by the Canadian Human Rights Act and jurisdictional human rights laws |

A-5.02 Uses mentoring techniques

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| A-5.02.01P | identify and communicate learning objective and point of lesson | apprentice or learner can explain objective and point of lesson |
| A-5.02.02P | link lesson to other lessons and project | lessons and unplanned learning opportunities are defined |
| A-5.02.03P | demonstrate performance of a skill to an apprentice or learner | steps required to demonstrate a skill are performed |
| A-5.02.04P | set up conditions required for apprentice or learner to practice a skill | practice conditions are set up so that skill can be practiced safely by apprentice or learner |
| A-5.02.05P | set up conditions where apprentice or learner feels comfortable communicating and asking questions | conditions are such that apprentice or learner feels comfortable communicating and asking questions |
| A-5.02.06P | recognize and discuss multiple techniques for performing trade tasks and options that may be best for apprentice or learner | multiple techniques for performing trade tasks and options that may be best for apprentice or learner are recognized and discussed |
| A-5.02.07P | assess apprentice or learner's ability to perform tasks with increasing independence | performance of apprentice or learner improves with practice to a point where task can be done with little supervision |

| Reference Code | Performance Criteria | Evidence of Attainment |
|-----------------------|--|--|
| A-5.02.08P | give supportive and constructive feedback | apprentice or learner adopts best practice after receiving supportive or constructive feedback |
| A-5.02.09P | support accommodations and alternate work practices that are appropriate for apprentice or learner | accommodations and alternate work practices that are appropriate for apprentice or learner are supported |
| A-5.02.10P | assess apprentice or learner suitability to trade during probationary period | apprentice or learner is given constructive feedback that helps them identify their own strengths and weaknesses and suitability for trade |

Range of Variables (include, but not limited to)

| | |
|--|--|
| steps required to demonstrate a skill | understanding who, what, where, when, why, and how, explaining, showing, giving encouragement, following up to ensure skill is performed correctly |
| practice conditions | guided, limited independence, full independence |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| A-5.02.01L | demonstrate knowledge of strategies for learning skills in workplace | <ul style="list-style-type: none"> a. describe importance of individual experience b. describe shared responsibilities for workplace learning c. determine one's own learning preferences and explain how these relate to learning new skills d. describe importance of different types of skills in workplace e. describe importance of skills for success (essential skills) in workplace f. identify different learning styles g. identify different learning needs and strategies to meet them h. identify strategies to assist in learning a skill |
| A-5.02.02L | demonstrate knowledge of strategies for teaching workplace skills | <ul style="list-style-type: none"> a. identify different roles played by workplace mentor b. explain importance of identifying point of lesson c. identify how to choose a good time to present lesson d. explain importance of linking lessons e. identify context for learning skills f. describe considerations in setting up opportunities for skill practice g. explain importance of providing feedback h. identify techniques for giving effective feedback i. describe a skills assessment j. identify methods of assessing progress k. explain how to adjust lesson to different situations |

Range of Variables (include, but not limited to)

| | |
|--|---|
| skills for success (essential skills) are | adaptability, collaboration, communication, creativity and innovation, digital, numeracy, problem solving, reading, writing |
| learning styles | visual, auditory, kinesthetic |
| learning needs | learning disabilities, learning preferences, language proficiency |
| strategies to assist in learning a skill | understanding basic principles of instruction, developing coaching skills, being mature and patient, providing feedback, repetition |

Major Work Activity B - Performs rigging, hoisting and positioning, and mobilization, erection, and demobilization of cranes

Task B-6 Plans lift

Task Descriptor

Ironworkers (structural/ornamental) plan lifts by assessing loads and performing a pre-lift analysis. They calculate and verify load requirements to select rigging, hoisting and positioning equipment accordingly. Ironworkers (structural/ornamental) secure the lift area to ensure that safe rigging, hoisting and positioning practices are followed to minimize hazards, avoid personal injury and equipment damage.

B-6.01 Assesses load

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---------------------------------------|--|
| B-6.01.01P | identify load to be hoisted or lifted | load to be hoisted or lifted is identified according to task and lift plan |
| B-6.01.02P | inspect load | load is inspected for shape, rigging points, unknown weight factors and material integrity |
| B-6.01.03P | calculate total weight of load | total weight of load is calculated by using reference materials and formulas, and by measuring load |
| B-6.01.04P | verify total weight of load | total weight of load is verified against fabrication drawings or bill of lading |
| B-6.01.05P | determine centre of gravity | centre of gravity is determined by visual inspection of weight distribution or is calculated by using formulas |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| B-6.01.06P | select and use tools and equipment | tools and equipment are selected according to task |

Range of Variables (include, but not limited to)

| | |
|--|---|
| unknown weight factors and material integrity | product residue, build-up of foreign matter, corrosion, material damage, temporary bracing and fasteners |
| tools and equipment | measuring and layout equipment, reference cards, load charts, calculator, calculator apps/ software, BIM technology |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| B-6.01.01L | demonstrate knowledge of load requirements | a. list properties of load to be lifted that need to be considered |
| B-6.01.02L | demonstrate knowledge of calculations and related factors to determine properties of load | a. describe procedures to inspect load b. identify formulas and calculations to determine load weight c. describe procedures to determine center of gravity d. identify related factors for calculations and load weight |
| B-6.01.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|---------------------------|---|
| properties of load | dimensions, shape, weight, centre of gravity, condition of load |
| related factors | reference materials, catalogs, drawings, bills of lading |

B-6.02 Performs pre-lift analysis

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| B-6.02.01P | determine final location and orientation of load | final location and orientation of load is determined according to task, site conditions and drawings |
| B-6.02.02P | determine type of lift | type of lift is determined according to application, site conditions, weight of load, drawings, engineering specifications and jurisdictional regulations |
| B-6.02.03P | determine rigging factors | rigging factors are determined to select rigging, hoisting and positioning equipment according to task |
| B-6.02.04P | perform pre-lift site inspection | pre-lift site inspection is performed to determine travel path and rigging requirements according to rigging and hoisting and positioning factors |
| B-6.02.05P | determine if permit is required | permit requirements are determined according to jurisdictional regulations and site-specific requirements |
| B-6.02.06P | determine if test lift is required | test lift requirements are determined according to jurisdictional regulations and site-specific requirements |
| B-6.02.07P | identify location for hoisting and positioning equipment | location for hoisting and positioning equipment is identified according to hoisting and positioning factors |
| B-6.02.08P | identify procedure and access equipment required for rigging attachment and removal | procedure and access equipment required for rigging attachment and removal is identified according to site conditions and jurisdictional regulations |

| Reference Code | Performance Criteria | Evidence of Attainment |
|-----------------------|---|--|
| B-6.02.09P | confirm load securing methods | load securing methods are confirmed in final location according to drawings and engineering specifications |
| B-6.02.10P | determine communication methods | communication methods are determined according to line of sight and site-specific requirements |
| B-6.02.11P | identify personnel needed to perform rigging tasks | personnel needed to perform rigging tasks are identified according to site-specific requirements and jurisdictional regulations |
| B-6.02.12P | perform test lift | test lift is performed according to site-specific requirements and jurisdictional regulations |

Range of Variables (include, but not limited to)

| | |
|---|--|
| type of lifts | simple, tandem, critical (hoisting personnel, tandem, near capacity, powerlines), engineered |
| rigging factors | obstacles, head room, opening size, hazards, weight of load, fleet angles, anchor points, block loading, parts of line including friction, sling tension, boom deflection, centre of gravity, hardware and hitch selection, site specific environmental factors (e.g., caustic, acidic, abrasive, heat, site conditions) |
| hoisting and positioning factors | ground conditions, crane swing radius, obstacles, load charts, hazards, weight of load, environmental (e.g., rain, wind, snow, working on water) |
| load securing methods | lashing, welding, using fasteners, shoring, bolting, guy line cables |
| access equipment | mobile elevating work platform, personnel baskets, scaffolding, fall arrest system, ladders |
| communication methods | visual (hand signals), audio (two-way radios, voice) |
| personnel | supervisor, operators, signaler, riggers, tag line persons |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-6.02.01L | demonstrate knowledge of rigging, hoisting and positioning | <ul style="list-style-type: none"> a. identify types of rigging, hoisting and positioning equipment, and describe their characteristics, applications and procedures for use b. identify types of lifts, and describe their characteristics and applications c. interpret information pertaining to rigging, hoisting and positioning found on drawings and engineering specifications |
| B-6.02.02L | demonstrate knowledge of procedures to perform pre-lift analysis | <ul style="list-style-type: none"> a. describe procedures to inspect area surrounding lift b. identify hazards, and describe safe work practices pertaining to rigging, hoisting and positioning c. identify and describe communication methods used during rigging, hoisting and positioning d. identify and describe delegation of responsibilities for personnel e. describe procedures to perform walk-through f. explain effects of sling angle when preparing for rigging, hoisting and positioning operations |
| B-6.02.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | <ul style="list-style-type: none"> a. interpret jurisdictional regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|------------------------------|--|
| type of lifts | simple, tandem, critical (hoisting personnel, tandem, near capacity, powerlines), engineered |
| hazards | overhead obstacles, boom interference, ground conditions, swing path, electrocution |
| communication methods | visual (hand signals), audio (two-way radios, voice) |
| personnel | supervisor, operators, signaler, riggers, tag line persons |

B-6.03 Selects rigging, hoisting and positioning equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|-----------------------|---|--|
| B-6.03.01P | verify characteristics of load | characteristics of load determined in load assessment are identified to ensure load control when selecting rigging, hoisting and positioning equipment |
| B-6.03.02P | select rigging equipment | rigging equipment is selected according to rigging tag information, working load limits (WLL), rigging configuration and sling tension |
| B-6.03.03P | select hoisting and positioning equipment | hoisting and positioning equipment is selected according to factors |
| B-6.03.04P | protect rigging, hoisting and positioning equipment , and load | rigging, hoisting and positioning equipment , and load are protected during lift to avoid equipment and load damage |

Range of Variables (include, but not limited to)

| | |
|--------------------------------|---|
| characteristics of load | shape, material integrity, size, centre of gravity, weight, pick points |
|--------------------------------|---|

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| factors | weight being hoisted, radius and distance to be lifted, parts of line used, hoisting location |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-6.03.01L | demonstrate knowledge of rigging, hoisting and positioning equipment , their applications, characteristics and procedures for use | <ul style="list-style-type: none"> a. identify types of rigging, hoisting and positioning equipment, and describe their applications, characteristics and procedures for use b. identify factors to consider when selecting rigging, hoisting and positioning equipment c. identify wire ropes, and describe their characteristics and applications d. identify and describe construction, grades and applications of natural fibre and synthetic ropes e. describe and demonstrate testing and strength reductions of knots and splices f. interpret and describe rigging tag information |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| B-6.03.02L | demonstrate knowledge of calculations required to select rigging, hoisting and positioning equipment | <ul style="list-style-type: none"> a. explain effects of sling angles when preparing for rigging, hoisting and positioning operations b. identify and describe WLL formulas, factors and reductions for natural fibre, synthetic fibre and wire ropes c. calculate rigging, hoisting and positioning equipment capacities d. identify elements of crane charts e. identify swing zone and swing clearance f. identify elements tables and charts for slings and attachments |
| B-6.03.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning equipment | <ul style="list-style-type: none"> a. interpret jurisdictional regulations pertaining to rigging, hoisting and positioning equipment |

Range of Variables (include, but not limited to)

| | |
|---|---|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| factors | weight being hoisted, radius and distance to be lifted, parts of line used, hoisting location |
| characteristics (wire rope) | construction (lays, cores) and its advantages, wire rope cores, classifications, constructions, WLL (material strength), material rejection criteria, care and handling of materials (wire rope, nylon, polyester, chain) of natural ropes and slings (synthetic fibre ropes) |
| rigging tag information | date, size, capacity, manufacturer, configuration, material |

B-6.04 Secures lift area

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--------------------------------|---|
| B-6.04.01P | perform walk-around inspection | walk-around inspection is performed to confirm hazards , path of travel, swing direction or ground conditions have not changed according to pre-lift site inspection |
| B-6.04.02P | establish safety perimeter | non-essential personnel are cleared of lifting area and safety perimeter is established by installing signage and assigning personnel to monitor lift perimeter |

Range of Variables (include, but not limited to)

| | |
|----------------|---|
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges, electrocution, overhead obstructions |
| signage | barricades, barrier tape, tags and signs |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-6.04.01L | demonstrate knowledge of procedures to secure lift area | a. describe procedures to secure lift area b. identify hazards , and describe safe work practices pertaining to securing lift area prior to rigging, hoisting and positioning |
| B-6.04.02L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | a. interpret jurisdictional regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|---------------------------------------|---|
| procedures to secure lift area | installing and tagging barriers, assessing ground conditions, ensuring that work area is not congested or obstructed for emergency access, limiting approach, obtaining required permits, non-essential personnel are cleared of lifting area |
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges, electrocution, overhead obstructions |

Task B-7 Rigs, hoists and positions load

Task Descriptor

Rigging is an integral part of the ironworker (structural/ornamental) trade. Rigging equipment is used to ensure loads or personnel can be hoisted in a safe and secure manner. Hoisting a load is lifting the equipment or components into place according to task and lift plan. In many cases, it is a team effort involving operators, signallers, riggers and supervisors. It is important that ironworkers (structural/ornamental) participate in hoisting and positioning operations for safety and to ensure that personnel, equipment, and components are protected during the operation.

B-7.01 Inspects rigging, hoisting and positioning equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| B-7.01.01P | conduct inspection of rigging, hoisting and positioning equipment , and document | inspection of rigging, hoisting and positioning equipment is conducted, pre-use and throughout task, and documented according to industry standards, manufacturers' specifications, jurisdictional regulations, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| B-7.01.02P | verify inspection certification | inspection certification is verified to ensure dates are valid according to jurisdictional regulations, and company policies and procedures |
| B-7.01.03P | identify damaged rigging, hoisting and positioning equipment , and remove from service | damaged rigging, hoisting and positioning equipment is identified, tagged, removed from service and reported according to manufacturers' specifications, and company policies and procedures |
| B-7.01.04P | verify WLL | WLL is verified according to rigging tag information and industry standards |

Range of Variables (include, but not limited to)

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| damaged | kinks, broken wires, arc mark, tears, cuts, cracks, rust, corrosion, chemical burns, bird caging, contamination, wear, overload, illegible/missing tag |
| rigging tag information | date, size, capacity, manufacturer, configuration, material |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-7.01.01L | demonstrate knowledge of rigging, hoisting and positioning equipment , their applications, characteristics and procedures for use | <ol style="list-style-type: none"> identify types of rigging, hoisting and positioning equipment, and describe their applications, characteristics and procedures for use interpret rigging tag information |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|---|
| B-7.01.02L | demonstrate knowledge of procedures to inspect rigging, hoisting and positioning equipment | <ul style="list-style-type: none"> a. describe sequence of inspection of rigging, hoisting and positioning equipment b. describe procedures to inspect rigging, hoisting and positioning equipment c. identify removal criteria for damaged rigging, hoisting and positioning equipment |
| B-7.01.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| rigging tag information | date, size, capacity, manufacturer, configuration, material |
| damaged | kinks, broken wires, arc mark, tears, cuts, cracks, rust, corrosion, chemical burns, bird caging, contamination, wear, overload, illegible/missing tag |

B-7.02 Assembles rigging, hoisting and positioning equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| B-7.02.01P | identify procedures and requirements | procedures and requirements for assembly are identified according to equipment being used, manufacturers' specifications, and company policies and procedures |
| B-7.02.02P | select rigging, hoisting and positioning equipment and components | rigging, hoisting and positioning equipment and components are selected according to task or lift plan |
| B-7.02.03P | select and use tools and equipment | tools and equipment are selected and used to assemble rigging, hoisting and positioning equipment and components according to task or lift plan |
| B-7.02.04P | determine order of assembly | order of assembly is determined according to task or lift plan |
| B-7.02.05P | use communication methods | communication methods are used during assembly according to task, site conditions, and company policies and procedures |
| B-7.02.06P | set up rigging, hoisting and positioning equipment | rigging, hoisting and positioning equipment is set up according to engineering and manufacturers' specifications, industry standards, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|--------------------------|---|
| procedures | spooling cable on drum, preparing ground, reeving blocks, mounting tuggers, assembling crane components |
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |

| | |
|---|--|
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| components | boom, tracks, counterweight, wire rope, jib, pads, mats, block, wedge socket |
| communication methods | visual (hand signals), audio (two-way radios, voice) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| B-7.02.01L | demonstrate knowledge of rigging, hoisting and positioning equipment and components , their applications, characteristics and procedures for use | a. identify types of rigging, hoisting and positioning equipment and components , and describe their applications, characteristics and procedures for use |
| B-7.02.02L | demonstrate knowledge of procedures used to assemble rigging, hoisting and positioning equipment and components | a. identify tools and equipment used to assemble rigging, hoisting and positioning equipment and components , and describe their procedures for use b. identify hazards , and describe safe work practices pertaining to assembling rigging, hoisting and positioning equipment and components c. describe procedures for placement, assembly and installation of rigging, hoisting and positioning equipment and components d. interpret load charts, lift radius and boom length e. describe communication methods used during assembly of rigging, hoisting and positioning equipment |
| B-7.02.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|---|---|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| components | boom, tracks, counterweight, wire rope, jib, pads, mats, block, wedge socket |
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges, electrocution, overhead obstructions |
| procedures | spooling cable on drum, preparing ground, reeving blocks, mounting tuggers, assembling crane components |
| communication methods | visual (hand signals), audio (two-way radios, voice) |

B-7.03 Attaches rigging equipment to load

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|-----------------------------------|---|
| B-7.03.01P | access rigging points | rigging points are accessed using access equipment according to task, company policies and procedures and jurisdictional regulations |
| B-7.03.02P | assemble and connect main rigging | main rigging is assembled and connected to load according to lift plan, and company policies and procedures |
| B-7.03.03P | adjust rigging equipment | rigging equipment is adjusted to change orientation according to site-specific requirements, lift plan and task |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| B-7.03.04P | identify and attach control devices | control devices are identified and attached according to task, jurisdictional regulations, lift plan, and company policies and procedures |
| B-7.03.05P | select and use knots, bends and hitches | knots, bends and hitches are selected and used according to lift requirements to ensure control of load |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|--|
| access equipment | mobile elevating work platform, personnel baskets, scaffolding, fall arrest system |
| rigging equipment | chain falls, come-alongs, turn buckles, manual cable puller (grip hoist) |
| knots, bends and hitches | bowline, self-centering bowline, running bowline, clove hitch, half hitch, reef (square) knot, timber hitch, rolling hitch, sheet bend, fisherman bend |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-7.03.01L | demonstrate knowledge of rigging , hoisting and positioning equipment, their applications, characteristics and procedures for use | a. identify types of rigging , hoisting and positioning equipment, and describe their applications, characteristics and procedures for use b. interpret rigging tag information |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-7.03.02L | demonstrate knowledge of procedures to attach rigging equipment to load | <ul style="list-style-type: none"> a. identify tools and equipment used to attach rigging equipment to load, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to attaching rigging equipment to load c. list and describe requirements and specifications involved in rigging operations d. describe function, advantages and limitations of various hitches and configurations e. identify types of knots, bends and hitches, and describe their characteristics and applications f. demonstrate ability to tie knots, bends and hitches g. describe steps to splice wire, natural fibre and synthetic fibre ropes h. describe procedures to perform back splice, side splice and short splice i. define, describe and demonstrate ability to apply material handling attachments j. identify attachment points k. identify jacking points l. identify jacking equipment, and describe their characteristics, applications and procedures for use m. identify rolling equipment, and describe their characteristics, applications and procedures for use |
| B-7.03.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|--------------------------------------|---|
| rigging equipment | chain falls, come-alongs, turn buckles, manual cable puller (grip hoist) |
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges, electrocution, overhead obstructions |
| hitches and configurations | basket, choker, bridle hitch, vertical hitch |
| knots, bends and hitches | bowline, self-centering bowline, running bowline, clove hitch, half hitch, reef (square) knot, timber hitch, rolling hitch, sheet bend, fisherman bend |
| material handling attachments | hooks and shackles, eyebolts, chains, additional industry attachments |

B-7.04 Performs hoisting and positioning operations

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|-----------------------|---|--|
| B-7.04.01P | participate in pre-lift meeting | pre-lift meeting is attended to understand roles and responsibilities of all involved in task according to lift plan |
| B-7.04.02P | use communication methods | communication methods are used during hoisting and positioning according to site conditions |
| B-7.04.03P | operate hoisting and positioning equipment | hoisting and positioning equipment is operated according to lift plan, manufacturers' specifications, jurisdictional regulations, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| B-7.04.04P | control load | load is controlled using tag lines, holdbacks and secondary rigging according to jurisdictional regulations, and company policies and procedures |
| B-7.04.05P | recognize and correct lift or rigging irregularities | lift or rigging irregularities are recognized and corrected according to task and industry standards |
| B-7.04.06P | transfer loads to various hoisting and positioning equipment | loads are transferred to various hoisting and positioning equipment for final placement according to task and site conditions |

Range of Variables (include, but not limited to)

| | |
|---|---|
| communication methods | visual (hand signals), audio (two-way radios, voice) |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks, self-propelled modular transporter (SPMT), launching gantries |
| loads | smooth loads, heavy loads, long flexible loads, unstable loads, heavy fragile units, finished or coated loads, large surface area (sail) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-7.04.01L | demonstrate knowledge of procedures to perform hoisting and positioning operations | <ul style="list-style-type: none"> a. identify types of hoisting and positioning equipment, and describe their applications, characteristics and procedures for use b. identify hazards, and describe safe work practices pertaining to performing hoisting and positioning operations c. describe procedures to perform hoisting and positioning operations d. identify topics discussed in pre-lift meetings e. describe elements of engineering specifications f. list and describe types, parts and configurations of hoisting and positioning equipment g. identify various slings and sling arrangements, and describe their characteristics and applications h. identify slings and hitches used for hoisting and positioning i. describe use and identify location for slings, tag lines and sling configurations on loads for hoisting and positioning j. describe procedures to determine centre of gravity for different types of loads |

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|--|---|
| B-7.04.02L | demonstrate knowledge of communication methods | <ul style="list-style-type: none"> a. list and demonstrate hand signals used when performing hoisting and positioning operations b. describe methods and precautions in using hand signals c. describe and demonstrate voice communications on a two-way radio d. list precautions used in verbal communication |
| B-7.04.03L | demonstrate knowledge of regulatory requirements pertaining to hoisting and positioning operations | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to hoisting and positioning operations |

Range of Variables (include, but not limited to)

| | |
|---|---|
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks, self-propelled modular transporter (SPMT), launching gantries |
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges, electrocution, overhead obstructions |
| loads | smooth loads, heavy loads, long flexible loads, unstable loads, heavy fragile units, finished or coated loads, large surface area (sail) |
| communication methods | visual (hand signals), audio (two-way radios, voice) |

B-7.05 Secures load before rigging removal

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|-------------------------------------|---|
| B-7.05.01P | confirm orientation of load | orientation of load, before detaching from rigging, hoisting and positioning equipment, is confirmed according to drawings , match and piece marks, and other reference points |
| B-7.05.02P | ensure stability of load | stability of load is ensured by using shims, wedges, cribbing and bracing methods according to drawings , and company policies and procedures |
| B-7.05.03P | use load isolation procedures | load isolation procedures are used while load is attached to hoisting equipment when welding is required |
| B-7.05.04P | prepare load for removal of rigging | load is prepared for removal of rigging using fastening equipment according to drawings , jurisdictional regulations, and company policies and procedures |
| B-7.05.05P | temporarily suspend loads | loads for subsequent placement are temporarily suspended using bracing or other equipment |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| drawings | fabrication, erection |
| bracing methods | guy wires, false work, temporary supports, adjustable brace poles, lashing |
| fastening equipment | bolts, nuts, welding |
| other equipment | chain falls, come-alongs, manual cable puller (grip hoist), strong backs, beam clamps, pad eyes, dunnage, cribbing |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| B-7.05.01L | demonstrate knowledge of procedures to secure load before rigging removal | <ul style="list-style-type: none"> a. identify tools and equipment used to secure load before rigging removal, and describe their procedures for use b. identify methods to determine orientation c. identify and describe procedures to secure load before rigging removal d. identify bracing methods e. identify other equipment used to temporarily suspend loads |
| B-7.05.02L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning |

Range of Variables (include, but not limited to)

| | |
|------------------------|--|
| bracing methods | guy wires, false work, temporary supports, adjustable brace poles, lashing |
| other equipment | chain falls, come-alongs, manual cable puller (grip hoist), strong backs, beam clamps, pad eyes, dunnage, cribbing |

Task B-8 Performs post-lift activities

Task Descriptor

Post-lift inspections and disassembly of rigging, hoisting and positioning equipment are done after the lift is completed. Ironworkers (structural/ornamental) continually maintain rigging, hoisting and positioning equipment to ensure public and personnel safety, optimal operation of the equipment and to avoid equipment damage.

B-8.01 Conducts post-lift inspection

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| B-8.01.01P | inspect area | area is inspected for hazards , obstructions, damages and other anomalies |
| B-8.01.02P | eliminate hazards | hazards identified during post-lift inspection are eliminated by taking actions according to task, jurisdictional regulations, and company policies and procedures |
| B-8.01.03P | assess, tag and report any damaged installed equipment and materials | damaged installed equipment and materials are assessed, tagged and reported to supervision according to company policies and procedures |
| B-8.01.04P | inspect and identify damaged, worn or unsafe rigging, hoisting and positioning equipment and remove from service | inspection is performed, and damaged, worn or unsafe rigging, hoisting and positioning equipment is identified and removed from service according to jurisdictional regulations, manufacturers' specifications, and company policies and procedures |
| B-8.01.05P | ensure area is clear and remove barriers and signs | area is deemed clear, and barriers and signs are removed |

Range of Variables (include, but not limited to)

| | |
|---|---|
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges |
| actions | installing barriers and signs, re-installing grating and railing, housekeeping, post-lift meeting, installing bracing and temporary support, verifying integrity of blocking and cribbing |
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|--|---|
| B-8.01.01L | demonstrate knowledge of post-lift inspections | a. list and describe elements of inspections done after each lift b. list and describe elements of inspections done after job completion |
| B-8.01.02L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning | a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning |

B-8.02 Disassembles rigging, hoisting and positioning equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| B-8.02.01P | coordinate work | work is coordinated according to task |
| B-8.02.02P | identify order of component disassembly | order of component disassembly is identified according to manufacturers' specifications and equipment used for task |
| B-8.02.03P | select and use tools and equipment | tools and equipment are selected and used according to rigging, hoisting and positioning equipment being disassembled, and jurisdictional regulations |
| B-8.02.04P | load and secure rigging, hoisting and positioning equipment for transport | rigging, hoisting and positioning equipment is loaded and secured for transport according to manufacturers' specifications, destination and jurisdictional regulations |

Range of Variables (include, but not limited to)

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| B-8.02.01L | demonstrate knowledge of procedures to disassemble rigging, hoisting and positioning equipment and their components | <ul style="list-style-type: none"> a. identify tools and equipment used to disassemble rigging, hoisting and positioning equipment and their components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to disassembling rigging, hoisting and positioning equipment and their components c. identify rigging, hoisting and positioning equipment requiring disassembly d. describe sequence of disassembly for rigging, hoisting and positioning equipment |
| B-8.02.02L | demonstrate knowledge of training and certification requirements to perform rigging, hoisting and positioning operations | <ul style="list-style-type: none"> a. identify safety training and certification requirements to perform rigging, hoisting and positioning operations |
| B-8.02.03L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning operations | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning operations |

Range of Variables (include, but not limited to)

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |
| hazards | slips, trips, falls, struck by material, overexertion, pinching, crushing, miscommunication with personnel, leading edges |

B-8.03 Maintains rigging, hoisting and positioning equipment

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| B-8.03.01P | perform inspection of rigging , hoisting and positioning equipment | inspections are performed to recognize damaged and defective rigging, hoisting and positioning equipment according to manufacturers' specifications, and company policies and procedures |
| B-8.03.02P | identify damaged or defective rigging, hoisting and positioning equipment , and remove from service | damaged or defective rigging, hoisting and positioning equipment is tagged, removed from service, and reported according to manufacturers' specifications, and company policies and procedures |
| B-8.03.03P | clean and lubricate rigging, hoisting and positioning equipment | rigging, hoisting and positioning equipment is cleaned and lubricated according to manufacturers' specifications to ensure that parts run freely and to prevent corrosion |
| B-8.03.04P | store and secure rigging, hoisting and positioning equipment | rigging, hoisting and positioning equipment is stored and secured in dry locations and out of the elements according to manufacturers' specifications, site-specific requirements, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| B-8.03.01L | demonstrate knowledge of procedures to maintain rigging, hoisting and positioning equipment | <ul style="list-style-type: none"> a. describe procedures to inspect rigging, hoisting and positioning equipment b. describe procedures to remove damaged or defective rigging, hoisting and positioning equipment from service c. describe maintenance requirements for rigging, hoisting and positioning equipment d. describe procedures to store and secure rigging, hoisting and positioning equipment |
| B-8.03.02L | demonstrate knowledge of regulatory requirements pertaining to rigging, hoisting and positioning equipment | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to rigging, hoisting and positioning equipment |

Range of Variables (include, but not limited to)

| | |
|---|--|
| rigging equipment | slings, blocks, hardware, hooks, softeners, below the hook lifting devices (e.g., spreader, equalizer beams), shackles, chokers |
| hoisting and positioning equipment | cranes, manual cable puller (grip hoist), tuggers, chain falls, come-alongs, jacks, gantries, air castors, trailers, multi-rollers, blocks |

Task B-9 Performs mobilization, erection and demobilization of cranes

Task Descriptor

Ironworkers (structural/ornamental) participate in the mobilization, erection and demobilization of cranes on the worksite. This includes mobilization of telescopic boom cranes, as well as erection of lattice boom cranes, tower cranes and derricks. They may work in conjunction with crane operators to set up equipment. They are also responsible for demobilization of this equipment, which includes disassembly and preparing for transport.

B-9.01 Mobilizes telescopic boom cranes

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| B-9.01.01P | ensure and secure adequate space for set-up of telescopic boom cranes | adequate space for set-up of telescopic boom cranes is ensured and secured |
| B-9.01.02P | position telescopic boom cranes | telescopic boom cranes are positioned according to task and lift plan |
| B-9.01.03P | verify limits of approach | limits of approach are verified according to jurisdictional regulations, and company policies and procedures |
| B-9.01.04P | arrange for and verify locates to identify underground utilities | locates that identify underground utilities are verified |
| B-9.01.05P | select and use tools and components | tools and components are selected and used according to task |
| B-9.01.06P | install components | components are installed according to manufacturers' specifications |
| B-9.01.07P | assist in reeving blocks | assistance is provided to reeve blocks according to manufacturers' specifications |
| B-9.01.08P | inspect telescopic boom cranes and their components | telescopic boom cranes and their components are inspected |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| telescopic boom cranes | mobile cranes, boom trucks, industrial cranes, rough terrain cranes, mini-crawler cranes |
| components | jibs, pads and mats, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, outriggers |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|--|---|
| B-9.01.01L | demonstrate knowledge of telescopic boom cranes , their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of telescopic boom cranes, and describe their characteristics and applications b. identify crane components, and describe their characteristics and applications c. describe operating principles of telescopic boom cranes and their components d. identify communication methods used when performing assembly, and describe their characteristics and applications e. interpret information pertaining to telescopic boom cranes and their components found on manufacturers specifications |
| B-9.01.02L | demonstrate knowledge of procedures to mobilize telescopic boom cranes and their components | <ul style="list-style-type: none"> a. identify tools and equipment used to mobilize telescopic boom cranes and their components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to mobilizing telescopic boom cranes and their components c. describe sequence of mobilization of telescopic boom cranes and their components d. describe procedures to inspect telescopic boom cranes and their components |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| B-9.01.03L | demonstrate knowledge of regulatory requirements pertaining to mobilize telescopic boom cranes and their components | a. identify codes, standards and regulations pertaining to mobilization of telescopic boom cranes and their components |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| telescopic boom cranes | mobile cranes, boom trucks, industrial cranes, rough terrain cranes, mini-crawler cranes |
| components | jibs, pads and mats, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, outriggers |
| communication methods | visual (hand signals), audio (two-way radios, voice) |
| hazards | slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, miscommunication with personnel, electrocution, poor ground conditions, underground utilities |

B-9.02 Erects lattice boom cranes, tower cranes, derricks and components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| B-9.02.01P | ensure and secure adequate space for set-up of lattice boom cranes, tower cranes, derricks and components | adequate space for set-up of lattice boom cranes, tower cranes, derricks and components is ensured and secured according to task and site conditions |
| B-9.02.02P | verify limits of approach | limits of approach are verified according to jurisdictional regulations, and company policies and procedures |
| B-9.02.03P | arrange for and verify locates to identify underground utilities | locates that identify underground utilities are verified |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| B-9.02.04P | select and use tools, equipment and components | tools, equipment and components are selected and used according to manufacturing specifications |
| B-9.02.05P | install components | components are installed according to manufacturers' specifications |
| B-9.02.06P | assist in reeving | assistance is provided to reeve according to manufacturers' specifications |
| B-9.02.07P | inspect lattice boom cranes, tower cranes, derricks and components | lattice boom cranes, tower cranes, derricks and components are inspected according to jurisdictional regulations, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|--------------------------------------|---|
| lattice boom cranes | crawler, carrier-mounted |
| tower cranes | luffing jib, saddle jib, fixed tower, rotating tower, mobile tower |
| derricks | stiff leg, guy derrick, Chicago boom, A-frame, gin-pole |
| lattice boom crane components | lattice boom sections, pins, jibs, crane mats, swamp pads, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, superlift components, pendant lines, gantries, anti-two blocking device (A2B), hoists, hoist lines, anemometer |
| tower crane components | tower sections, mast, pins, jibs (e.g., main jib, counter jib), bases (anchor bolt, free-standing), collars, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, pendant lines, gantries, slewing ring, trolley, limit switches, anemometer |
| derrick components | mast, boom, base, guy lines, stiff legs, hoists, boom hoist reeving, pins, block |
| communication methods | visual (hand signals), audio (two-way radios, voice) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| B-9.02.01L | demonstrate knowledge of lattice boom cranes, tower cranes, derricks and components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of lattice boom cranes and components, and describe their characteristics and applications b. identify types of tower cranes and components, and describe their characteristics and applications c. identify types of derricks and components, and describe their characteristics and applications d. describe operating principles of lattice boom cranes and their components e. describe operating principles of tower cranes and their components f. describe operating principles of derricks and their components g. identify communication methods used when performing assembly, and describe their characteristics and applications h. interpret information pertaining to lattice boom cranes, tower cranes, derricks and components found on manufacturers specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| B-9.02.02L | demonstrate knowledge of procedures to erect lattice boom cranes, tower cranes, derricks and components | <ul style="list-style-type: none"> a. identify tools and equipment used to erect lattice boom cranes, tower cranes, derricks and components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to erecting lattice boom cranes, tower cranes, derricks and components c. describe sequence of erection of lattice boom cranes and components d. describe sequence of erection of tower cranes and components e. describe sequence of erection of derricks and components f. describe rigging procedures for lattice boom and tower sections g. describe blocking procedures for lattice boom and tower sections h. describe procedure for installing pins i. describe procedures for reeving j. describe procedures to inspect lattice boom cranes, tower cranes, derricks and components |
| B-9.02.03L | demonstrate knowledge of regulatory requirements pertaining to erection of lattice boom cranes, tower cranes, derricks and components | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to erection of lattice boom cranes, tower cranes, derricks and components |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| lattice boom cranes | crawler, carrier-mounted |
| tower cranes | luffing jib, saddle jib, fixed tower, rotating tower, mobile tower |
| derricks | stiff leg, guy derrick, Chicago boom, A-frame, gin-pole |

| | |
|--------------------------------------|---|
| lattice boom crane components | lattice boom sections, pins, jibs, crane mats, swamp pads, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, superlift components, pendant lines, gantries, anti-two blocking device (A2B), hoists, hoist lines, anemometer |
| tower crane components | tower sections, mast, pins, jibs (e.g., main jib, counter jib), bases (anchor bolt, free-standing), collars, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, pendant lines, gantries, slewing ring, trolley, limit switches, anemometer |
| derrick components | mast, boom, base, guy lines, stiff legs, hoists, boom hoist reeving, pins, block |
| communication methods | visual (hand signals), audio (two-way radios, voice) |
| hazards | slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, miscommunication with personnel, electrocution |

B-9.03 Performs demobilization and disassembly of cranes

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| B-9.03.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| B-9.03.02P | recognize hazards of disassembling and demobilizing cranes | hazards of disassembling and demobilizing cranes are recognized, and safety procedures are followed according to industry standards, manufacturers' specifications, jurisdictional regulations, and company policies and procedures |
| B-9.03.03P | disassemble crane components | crane components are disassembled according to manufacturers' specifications, industry standards, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| B-9.03.04P | prepares cranes and their components for transport | cranes and their components are prepared for transport according to manufacturers' specifications, jurisdictional regulations, industry standards, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|---|--|
| hazards | slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, miscommunication with personnel, electrocution, failure to follow manufacturers' specifications, underground utilities, poor ground conditions |
| crane components (for disassembly) | lattice boom sections, tower sections, mast pins, jibs, bases (anchor bolt, free-standing), collars, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, superlift components, pendant lines, gantries, A2B, guy lines, stiff legs, boom hoist, reeving hoists, hoist lines, trolley, limit switches, slewing ring, anemometer |
| crane components (for removing) | jibs, pads and mats, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| B-9.03.01L | demonstrate knowledge of cranes, their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify types of cranes, and describe their characteristics and applications b. identify crane components, and describe their characteristics and applications c. describe operating principles of cranes and their components d. identify communication methods used when performing demobilization and disassembly, and describe their characteristics and applications e. interpret information pertaining to cranes and equipment, and their components found on drawings and engineering specifications |
| B-9.03.02L | demonstrate knowledge of procedures to demobilize cranes and their components | <ul style="list-style-type: none"> a. identify tools and equipment used to demobilize cranes and their components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to demobilization of cranes and their components c. describe procedures to demobilize cranes and their components |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| B-9.03.03L | demonstrate knowledge of procedures to disassemble cranes and their components | <ul style="list-style-type: none"> a. identify tools and equipment used to disassemble cranes and their components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to disassembly of cranes and removal of their components c. describe procedures to disassemble cranes, and remove their components d. describe rigging procedures for lattice boom and tower sections e. describe blocking procedures for lattice boom and tower sections f. describe procedure for removing and storing pins |
| B-9.03.04L | demonstrate knowledge of regulatory requirements pertaining to disassembly and demobilization of cranes and their components | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to disassembly and demobilization of cranes and their components |

Range of Variables (include, but not limited to)

| | |
|---|--|
| crane components (for disassembly) | lattice boom sections, tower sections, mast pins, jibs, bases (anchor bolt, free-standing), collars, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights, superlift components, pendant lines, gantries, A2B, guy lines, stiff legs, boom hoist, reeving hoists, hoist lines, trolley, limit switches, slewing ring, anemometer |
| crane components (for removing) | jibs, pads and mats, headache ball (e.g., overhaul ball, auxiliary ball), block, counterweights |
| communication methods | visual (hand signals), audio (two-way radios, voice) |
| hazards | slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, miscommunication with personnel, electrocution, failure to follow manufacturers' specifications, underground utilities, poor ground conditions |

Major Work Activity C - Performs erection, assembly and installation

Task C-10 Installs primary and secondary structural members

Task Descriptor

Ironworkers (structural/ornamental) install primary and secondary structural members made from structural steel, precast concrete or timber. They attach, level, plumb, and align these members. They also erect falsework or other temporary structures to aid in the erection when necessary. They are responsible for finalization and completion of a secure installation which may include installation of all fasteners or welding of structural components.

C-10.01 Uses falsework

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|------------------------------------|--|
| C-10.01.01P | determine need for falsework | need for falsework is determined according to engineering specifications, task and industry standards |
| C-10.01.02P | select and use tools and equipment | tools and equipment are selected and used according to task |
| C-10.01.03P | determine location of falsework | location of falsework is determined according to engineering specifications, task and industry standards |
| C-10.01.04P | lay out and construct falsework | falsework is laid out and constructed according to engineering specifications, task and industry standards |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|----------------------------|---|
| C-10.01.05P | place and secure falsework | falsework is placed and secured according to engineering specifications, task and industry standards |
| C-10.01.06P | inspect falsework | falsework is inspected according to industry standards and engineering specifications |
| C-10.01.07P | remove falsework | falsework is removed once structural members can support themselves, according to engineering specifications, task and industry standards |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| C-10.01.01L | demonstrate knowledge of falsework, their components , characteristics and applications | <ul style="list-style-type: none"> a. identify falsework, and describe its characteristics and applications b. identify components of falsework, and describe their characteristics and applications c. interpret information pertaining to falsework found on drawings and specifications d. identify supports and bracing, and describe their characteristics and applications e. identify capacity and limitations of falsework |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| C-10.01.02L | demonstrate knowledge of procedures to erect falsework | <ul style="list-style-type: none"> a. identify tools and equipment used to erect falsework, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to erecting falsework c. describe procedures to layout and construct falsework d. describe procedures to inspect erected falsework |
| C-10.01.03L | demonstrate knowledge of procedures to remove falsework | <ul style="list-style-type: none"> a. identify tools and equipment used to remove falsework, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to removing falsework c. determine when it is safe to remove falsework d. describe procedures to remove falsework e. describe procedures to store falsework for re-use |
| C-10.01.04L | demonstrate knowledge of regulatory requirements pertaining to falsework | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to falsework |

Range of Variables (include, but not limited to)

| | |
|-------------------|---|
| components | seat clips, steel or timber beams or bents, posts, foundations, modular shoring frames, staging, post shores, horizontal shoring, jacks, temporary bracing, guy lines |
|-------------------|---|

C-10.02 Attaches structural members

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| C-10.02.01P | select and use tools, equipment and components | tools, equipment and components are selected and used according to task |
| C-10.02.02P | perform tasks at heights | tasks are performed at heights according to industry standards, jurisdictional regulations, site-specific requirements, task requirements, and company policies and procedures |
| C-10.02.03P | fit, place and modify structural members | structural members are fit, placed and modified according to drawings, engineering specifications and industry standards |
| C-10.02.04P | determine minimum fastening requirements to secure member | minimum fastening requirements to secure member are determined according to engineering specifications and industry standards |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|---|
| tools and equipment | drift pins, bull pins, connecting bar (sleever bar), spud wrenches (offset structural wrench), sledgehammer, combination wrench, speed bolt (quick bolt), joist chain, ironworker belt (bolt bag, frog [spud wrench holder]), bolt calibrator |
| components | clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers, anchors |
| perform tasks at heights | working from elevated work platforms, working out of a personnel basket, working from the structure, using a ladder |
| structural members | primary members (e.g., columns, beams, girders, trusses) secondary members (e.g., girts, purlins, braces, joists) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| C-10.02.01L | demonstrate knowledge of structural members , their components , materials , characteristics and applications | <ul style="list-style-type: none"> a. identify structural members, and describe their materials, characteristics and applications b. identify structural member components and fasteners, and describe their characteristics and applications c. interpret information pertaining to structural members and their components found on drawings and specifications |
| C-10.02.02L | demonstrate knowledge of procedures to attach structural members | <ul style="list-style-type: none"> a. identify tools and equipment used to attach structural members, components and fasteners, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to attaching structural members and their components c. describe procedures to attach structural members and their components d. describe procedures to inspect attached structural members, components and fasteners e. describe procedures to test fasteners |
| C-10.02.03L | demonstrate knowledge of regulatory requirements pertaining to attaching structural members | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to attaching structural members |

Range of Variables (include, but not limited to)

| | |
|---------------------------|---|
| structural members | primary members (e.g., columns, beams, girders, trusses) secondary members (e.g., girts, purlins, braces, joists) |
| components | clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers, anchors |
| materials | steel, mass timber, precast (structural), fiber-reinforced polymers (FRP) |
| fasteners | bolts, washers, nuts, pins, screws |

| | |
|----------------------------|---|
| tools and equipment | drift pins, bull pins, connecting bar (sleever bar), spud wrenches (offset structural wrench), sledgehammer, combination wrench, speed bolt (quick bolt), joist chain, ironworker belt (bolt bag, frog [spud wrench holder]), bolt calibrator |
| hazards | pinch and crush points, falls, falling objects, rigging failure, miscommunication with crane personnel, improper procedures, electrocution, ergonomic strains |

C-10.03 Levels, plumbs and aligns structural members

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| C-10.03.01P | select and use tools, equipment, components and fasteners | tools, equipment, components and fasteners are selected and used according to task and manufacturers' specifications |
| C-10.03.02P | attach temporary bracing | temporary bracing is attached according to engineering specifications, industry standards and drawings |
| C-10.03.03P | verify and adjust alignment | alignment is verified and adjusted according to gridlines |
| C-10.03.04P | verify and adjust plumb | plumb is verified and adjusted according to surveying equipment information |
| C-10.03.05P | verify and adjust elevations | elevations are verified and adjusted according to drawings and benchmarks using various methods |

Range of Variables (include, but not limited to)

| | |
|----------------------------|---|
| tools and equipment | levels (laser, spirit), surveying equipment (e.g., theodolite, total station, builders level, plumb bobs, string lines), measuring tape, dogs and wedges, sledgehammer, oxy-fuel cutting equipment, welding equipment, come-alongs, chain falls |
| components | clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers, anchors |
| fasteners | bolts, washers, nuts, pins, screws |
| temporary bracing | cables and guy lines, jacks, grip-action hoist (manual wire rope winch), come-alongs, wire rope slings, turnbuckles, wire rope clips, lugs |
| methods | using shims, levelling nuts, sag rods (hanger rods), jacks, wedges |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|--|--|
| C-10.03.01L | demonstrate knowledge of structural members , their components , materials , characteristics and applications | <ul style="list-style-type: none"> a. identify structural members, and describe their characteristics and applications b. identify structural member components, materials and fasteners, and describe their characteristics and applications c. interpret information pertaining to structural members found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|---|
| C-10.03.02L | demonstrate knowledge of procedures to level, align and plumb structural members | <ul style="list-style-type: none"> a. identify tools and equipment used to level, align and plumb structural members, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to levelling, aligning and plumbing structural members c. describe procedures to level, align and plumb structural members d. identify plumbing and aligning tolerances e. describe procedures to install temporary bracing f. describe procedures to inspect levelled, aligned and plumbed structural members and temporary bracing g. describe procedures to verify accuracy of surveying tools |
| C-10.03.03L | demonstrate knowledge of training requirements to level, align and plumb structural members | <ul style="list-style-type: none"> a. identify training requirements to level, align and plumb structural members |
| C-10.03.04L | demonstrate knowledge of regulatory requirements pertaining to levelling, aligning and plumbing structural members | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to levelling, aligning and plumbing structural members |

Range of Variables (include, but not limited to)

| | |
|----------------------------|---|
| structural members | primary members (e.g., columns, beams, girders, trusses) secondary members (e.g., girts, purlins, braces, joists) |
| components | clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers, anchors |
| materials | steel, mass timber, precast (structural), FRP |
| fasteners | bolts, washers, nuts, pins, screws |
| tools and equipment | levels (laser, spirit), surveying equipment (e.g., theodolite, total station, builders level, plumb bobs, string lines), measuring tape, dogs and wedges, sledgehammer, oxy-fuel cutting equipment, welding equipment, come-alongs, chain falls |

| | |
|--------------------------|--|
| temporary bracing | cables and guy lines, jacks, grip-action hoist (manual wire rope winch), come-alongs, wire rope slings, turnbuckles, wire rope clips, lugs |
| hazards | over tensioning, improper application of wire rope clips, structural failure, pinch and crush points, overloading tensioning devices, wire rope failure, overhead work, fires, burns |

C-10.04 Completes installation of structural members

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| C-10.04.01P | select and use tools, equipment and components | tools, equipment and components are selected and used according to task |
| C-10.04.02P | select type, grade and length of fasteners | fastener type, grade and length are selected according to drawings and industry standards |
| C-10.04.03P | align and fasten structural members | structural members are aligned and fastened according to drawings and industry standards |
| C-10.04.04P | perform pre-installation verification test | pre-verification test for pre-tensioning methods is completed using hydraulic load cell |
| C-10.04.05P | pre-tension bolts | bolts are tensioned using tensioning methods according to codes, engineering and manufacturers' specifications, and industry standards |
| C-10.04.06P | fabricate, fit and attach structural members and connections on site | structural members and connections are fabricated, fit and attached on site according to drawings |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| tools and equipment | pins, bars, reamers, magnetic drill, oxy-fuel equipment, welding equipment, grinders, wedges, tensioning devices (electric and manual torque wrenches, tension control wrenches [shear wrenches], impact wrenches, hydraulic torque wrenches, multipliers), bolt tension calibrator, sledgehammer, hammer wrenches, drill drivers, drill bits, turn of nut gun |
| components | clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers |
| fasteners | bolts, washers, nuts, pins, screws |
| structural members | primary members (e.g., columns, beams, girders, trusses) secondary members (e.g., girts, purlins, braces, joists) |
| tensioning methods | using set torque value, using turn-of-nut method, using direct tension indicator (load indicator washers), using tension control, using snug-tight, all preinstallation verification tests |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|---|--|
| C-10.04.01L | demonstrate knowledge of structural members , their components , characteristics and applications | <ul style="list-style-type: none"> a. identify structural members, and describe their characteristics and applications b. identify structural member components and fasteners, and describe their characteristics and applications c. interpret information pertaining to structural members and their components found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| C-10.04.02L | demonstrate knowledge of procedures to complete installation of structural members | <ul style="list-style-type: none"> a. identify tools and equipment used to complete installation of structural members, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to complete installation of structural members c. describe procedures to complete installation of structural members d. describe procedures to install fasteners e. identify specifications and tolerance for welding and torque f. describe procedures to inspect attached structural members, components and fasteners |
| C-10.04.03L | demonstrate knowledge of training and certification requirements to complete installation of structural members | <ul style="list-style-type: none"> a. identify training and certification requirements to complete installation of structural members |
| C-10.04.04L | demonstrate knowledge of regulatory requirements pertaining to complete installation of structural members | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to complete installation of structural members |

Range of Variables (include, but not limited to)

| | |
|----------------------------|--|
| structural members | primary members (e.g., columns, beams, girders, trusses) secondary members (e.g., girts, purlins, braces, joists) |
| components | clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers |
| fasteners | bolts, washers, nuts, pins, screws |
| tools and equipment | pins, bars, reamers, magnetic drill, oxy-fuel equipment, welding equipment, grinders, wedges, tensioning devices (electric and manual torque wrenches, tension control wrenches [shear wrenches], impact wrenches, hydraulic torque wrenches, multipliers), bolt tension calibrator, sledgehammer, hammer wrenches, drill drivers, drill bits, turn of nut gun |

| | |
|--|--|
| hazards | loud noises, pinch points, crush points, awkward positioning, burns, repetitive motions, flying metal shavings, falling objects, sparks, hazardous gases, heavy lifting, electrocution, working at heights, fires, sharp edges, respiratory particulates |
| procedures to complete installation | welding, cutting, fitting, aligning, bolting, tensioning, applying coatings, pinning |

Task C-11 Installs ornamental, miscellaneous and steel cladding systems and components

Task Descriptor

Ironworkers (structural/ornamental) install ornamental components and systems. They install curtain walls and window walls. They also install miscellaneous components such as stairs, handrails, masonry supports, canopies and guard rails.

C-11.01 Installs curtain walls and window walls

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| C-11.01.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| C-11.01.02P | establish benchmarks and control lines | benchmarks and control lines are established according to surveying information, drawings and industry standards |
| C-11.01.03P | lay out anchors for curtain wall and window wall | anchors are laid out according to drawings and industry standards |
| C-11.01.04P | install curtain walls | curtain walls are installed according to codes, drawings, manufacturers' specifications and industry standards |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---------------------------------------|---|
| C-11.01.05P | install window wall components | window wall components are installed according to drawings, manufacturers' specifications and industry standards |
| C-11.01.06P | apply sealants | sealants are applied according to drawings, manufacturers' specifications and industry standards |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|--|
| curtain walls | precast (ornamental), pre-assembled panels (e.g., glass, spandrel, architectural) |
| window wall components | glazing, mullions, horizontal rails, shear blocks, anchors, setting blocks, infills, pressure pads/plates/bars, face caps, gaskets |
| sealants | hot melt, tape-grade, caulking |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|---|
| C-11.01.01L | demonstrate knowledge of curtain walls and window walls, their components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify curtain walls and window walls, and describe their characteristics and applications b. identify window wall components, and describe their characteristics and applications c. identify sealants, and describe their characteristics and applications d. interpret information pertaining to curtain walls and window walls found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| C-11.01.02L | demonstrate knowledge of procedures to install curtain walls and window walls | <ul style="list-style-type: none"> a. identify tools and equipment used to install curtain walls and window walls, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to installing curtain walls and window walls c. describe layout procedures d. describe procedures to install curtain walls and window walls e. describe glazing procedures f. describe procedures to inspect installed curtain walls and window walls |
| C-11.01.03L | demonstrate knowledge of regulatory requirements pertaining to installing curtain walls and window walls | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to installing curtain walls and window walls |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| curtain walls | precast (ornamental), pre-assembled panels (e.g., glass, spandrel, architectural) |
| window wall components | glazing, mullions, horizontal rails, shear blocks, anchors, setting blocks, infills, pressure pads/plates/bars, face caps, gaskets |
| sealants | hot melt, tape-grade, caulking |
| hazards | cuts, falls, falling material, wind, skin irritation, pinch points, repetitive motions, flying metal shavings, heavy lifting, material damage |

C-11.02 Installs miscellaneous components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| C-11.02.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| C-11.02.02P | fasten and attach miscellaneous components | miscellaneous components are fastened and attached using fasteners |
| C-11.02.03P | field-fabricate and modify miscellaneous components | miscellaneous components are field-fabricated and modified according to codes, task, drawings, and industry standards |
| C-11.02.04P | completes installation | installation is completed by cutting, grinding, welding and fitting components according to codes, task, drawings and industry standards |
| C-11.02.05P | perform finishing of miscellaneous components | finishing procedures of miscellaneous components are performed according to drawings, manufacturers' specifications and industry standards |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|---|
| miscellaneous components | stairs, railings, coverings, grating, decking, catwalks, joist reinforcing, canopies, roof screens, solar screens, building signage, parapet walls, elevator divider beams/hoist beams, doors, windows, access ladders, roof openings, public art |
| fasteners | bolts, screws, clips, mechanical anchors, chemical anchors, powder actuated fasteners, welding |
| finishing procedures | polishing, painting |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| C-11.02.01L | demonstrate knowledge of miscellaneous components , characteristics, applications and operation | <ul style="list-style-type: none"> a. identify miscellaneous components, and describe their characteristics and applications b. interpret information pertaining to miscellaneous components found on drawings and specifications |
| C-11.02.02L | demonstrate knowledge of procedures to install miscellaneous components | <ul style="list-style-type: none"> a. identify tools and equipment used to install miscellaneous components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to installing miscellaneous components c. describe procedures to install miscellaneous components d. describe finishing procedures for miscellaneous components e. describe procedures to inspect installed miscellaneous components |
| C-11.02.03L | demonstrate knowledge of regulatory requirements pertaining to installing miscellaneous components | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to installing miscellaneous components |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|---|
| miscellaneous components | stairs, railings, coverings, grating, decking, catwalks, joist reinforcing, canopies, roof screens, solar screens, building signage, parapet walls, elevator divider beams/hoist beams, doors, windows, access ladders, roof openings, public art |
| hazards | over tensioning, improper application of wire rope clips, structural failure, pinch and crush points, overloading tensioning devices, wire rope failure, overheard work, fires, burns, respiratory particulates |

C-11.03 Installs steel cladding and building envelope systems and components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| C-11.03.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| C-11.03.02P | establish benchmarks and control lines | benchmarks and control lines are established according to surveying information, drawings and industry standards |
| C-11.03.03P | lay out steel cladding and roofing , and building envelope systems and components for field fabrication and installation | steel cladding and roofing , and building envelope systems and components are laid out for field fabrication and installation according to task, drawings and industry standards |
| C-11.03.04P | install steel cladding and roofing | steel cladding and roofing are installed according to codes, drawings, manufacturers' specifications, industry standards, and company policies and procedures |
| C-11.03.05P | install building envelope systems and components | building envelope systems and components are installed according to codes, drawings, manufacturers' specifications, industry standards, and company policies and procedures |
| C-11.03.06P | apply sealants | sealants are applied according to drawings, manufacturers' specifications and industry standards |

Range of Variables (include, but not limited to)

| | |
|-----------------------------------|--|
| steel cladding and roofing | standing seam roof systems, screw-down roof systems, sandwich panels, composite field-assembled wall systems, metal decking |
| components | flashing (e.g., drip, base, J-trim, gable, low eave, gutter, downspout, closures, ridge caps), insulation, vapour barriers, trimmer/base angle |
| sealants | hot melt, tape-grade, caulking |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|---|---|
| C-11.03.01L | demonstrate knowledge of steel cladding, and building envelope systems and components , their characteristics, applications and operation | <ul style="list-style-type: none"> a. identify steel cladding and roofing, and describe their characteristics and applications b. identify building envelope systems and components, and describe their characteristics and applications c. identify sealants, and describe their characteristics and applications d. interpret information pertaining to steel cladding, and building envelope systems and components found on drawings and specifications |
| C-11.03.02L | demonstrate knowledge of emerging building technologies and practices pertaining to steel cladding, and building envelope systems and components | <ul style="list-style-type: none"> a. identify steel cladding, and building envelope systems and components technologies that contribute to net zero and carbon neutral commitments b. identify emerging technologies and practices pertaining to steel cladding, and building envelope systems and components and systems, and describe their characteristics and applications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| C-11.03.03L | demonstrate knowledge of procedures to install steel cladding, and building envelope systems and components | <ul style="list-style-type: none"> a. identify tools and equipment used to install steel cladding, and building envelope systems and components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to installing steel cladding, and building envelope systems and components c. describe layout procedures d. describe procedures to install steel cladding, and building envelope systems and components e. describe procedures to inspect installed steel cladding, and building envelope systems and components |
| C-11.03.04L | demonstrate knowledge of training and certification requirements to install steel cladding, and building envelope systems and components | <ul style="list-style-type: none"> a. identify training and certification requirements to install steel cladding, and building envelope systems and components |
| C-11.03.05L | demonstrate knowledge of regulatory requirements pertaining to installing steel cladding, and building envelope systems and components | <ul style="list-style-type: none"> a. identify codes, standards and regulations pertaining to installing steel cladding, and building envelope systems and components |

Range of Variables (include, but not limited to)

| | |
|-----------------------------------|--|
| steel cladding and roofing | standing seam roof systems, screw-down roof systems, sandwich panels, composite field-assembled wall systems, metal decking |
| components | flashing (e.g., drip, base, J-trim, gable, low eave, gutter, downspout, closures, ridge caps), insulation, vapour barriers, trimmer/base angle |
| sealants | hot melt, tape-grade, caulking |
| hazards | wind, sharp edges, working at heights, falling tools or materials, hidden electrical or piping, pinch points, flying metal shavings, foreign objects in eyes, unstable ground conditions |

Task C-12 Installs conveyors, machinery and equipment

Task Descriptor

Ironworkers (structural/ornamental) install conveyors and other material handling systems. They also install machinery, equipment, and modular buildings.

C-12.01 Installs material handling systems

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| C-12.01.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| C-12.01.02P | establish work points with surveying equipment | work points are established with surveying equipment according to drawings and industry standards |
| C-12.01.03P | assemble support steel components for material handling systems | support steel components for material handling systems are assembled according to drawings, manufacturers' specifications and industry standards |
| C-12.01.04P | assemble material handling system components | material handling system components are assembled according to drawings, manufacturers' specifications and industry standards |
| C-12.01.05P | complete installation | installation is completed by verifying connections and clearances, and coordinating with other trades |

Range of Variables (include, but not limited to)

| | |
|----------------------------------|--|
| support steel components | beams, hangers, rails, headers, braces |
| material handling systems | bulk (e.g., belt conveyors, screw conveyors, shakers, drag conveyors, crushers) and precision (e.g., power and free conveyor, electrified monorail, automated guided vehicle, robot cells), flat top, overhead crane, chain-on-edge, kilns |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|---|--|
| C-12.01.01L | demonstrate knowledge of material handling systems , their components, characteristics, applications and operation | <ul style="list-style-type: none"> a. identify material handling systems, and describe their characteristics and applications b. identify material handling systems components, and describe their characteristics and applications c. identify support steel components used for material handling systems d. describe operating principles of material handling systems and their components e. interpret information pertaining to material handling systems and their components found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| C-12.01.02L | demonstrate knowledge of procedures to install material handling systems | <ul style="list-style-type: none"> a. identify tools and equipment used to install material handling systems, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to installing material handling systems c. describe procedures to install material handling systems d. describe procedures to inspect installed material handling systems e. describe procedures to test installed material handling systems |

Range of Variables (include, but not limited to)

| | |
|----------------------------------|--|
| material handling systems | bulk (e.g., belt conveyors, screw conveyors, shakers, drag conveyors, crushers) and precision (e.g., power and free conveyor, electrified monorail, automated guided vehicle, robot cells), flat top, overhead crane, chain-on-edge, kilns |
| support steel components | beams, hangers, rails, headers, braces |
| hazards | crush and pinch points, stored energy, falls, structural failure, electrocution, high pressure hydraulic fluid, loud noises, awkward positioning, burns, repetitive motions, flying metal shavings, fires, congested work areas, sharp edges |

C-12.02 Performs alignment and commissioning of material handling systems

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| C-12.02.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| C-12.02.02P | establish benchmarks and control lines | benchmarks and control lines are established according to surveying information, drawings and industry standards |
| C-12.02.03P | verify tolerances | tolerances are verified according to drawings |
| C-12.02.04P | use precision tools and measuring instruments | precision tools and measuring instruments are used according to task and manufacturers' specifications |
| C-12.02.05P | rig and jack components | components are rigged and jacked according to task and manufacturers' specifications |
| C-12.02.06P | secure components | components are secured according to drawings and manufacturers' specifications |
| C-12.02.07P | test material handling system | material handling system is tested according to design and manufacturers' specifications |
| C-12.02.08P | troubleshoot for defects and malfunctions | defects are identified and malfunctions are resolved according to manufacturers' specifications and industry standards |

Range of Variables (include, but not limited to)

| | |
|--|--|
| tools and equipment | strongbacks, clamps, jigs, spacers, levels (laser, spirit), surveying equipment (e.g., theodolite, total station, builders level, plumb bobs, string lines), measuring tape, dogs and wedges, sledgehammer, oxy-fuel cutting equipment, welding equipment, cables and guys, come-alongs, chain falls |
| precision tools and measuring instruments | calipers, micrometers, feeler gauges, total station |
| material handling systems | bulk (e.g., belt conveyors, screw conveyors, shakers, drag conveyors, crushers) and precision (e.g., power and free conveyor, electrified monorail, automated guided vehicle, robot cells), kilns |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|---|---|
| C-12.02.01L | demonstrate knowledge of material handling systems , their components, characteristics, applications and operation | <ul style="list-style-type: none"> a. identify material handling systems, and describe their characteristics and applications b. identify material handling systems components, and describe their characteristics and applications c. identify support steel components used for material handling systems d. describe operating principles of material handling systems and their components e. interpret information pertaining to material handling systems and their components found on drawings and specifications |

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| C-12.02.02L | demonstrate knowledge of procedures to align material handling systems | <ul style="list-style-type: none"> a. identify tools and equipment used to align material handling systems, and describe their procedures for use b. identify precision tools and measuring equipment used to verify alignment, and describe their procedures for use c. identify hazards, and describe safe work practices pertaining to aligning material handling systems d. describe procedures to align material handling systems e. identify alignment specifications and tolerances f. describe procedures to inspect aligned material handling systems g. describe procedures to test aligned material handling systems |

Range of Variables (include, but not limited to)

| | |
|--|--|
| material handling systems | bulk (e.g., belt conveyors, screw conveyors, shakers, drag conveyors, crushers) and precision (e.g., power and free conveyor, electrified monorail, automated guided vehicle, robot cells), kilns |
| support steel components | beams, hangers, rails, headers, braces |
| tools and equipment | strongbacks, clamps, jigs, spacers, levels (laser, spirit), surveying equipment (e.g., theodolite, total station, builders level, plumb bobs, string lines), measuring tape, dogs and wedges, sledgehammer, oxy-fuel cutting equipment, welding equipment, cables and guys, come-alongs, chain falls |
| precision tools and measuring instruments | calipers, micrometers, feeler gauges, total station |
| hazards | crush and pinch points, stored energy, falls, structural failure, electrocution, loud noises, awkward positioning, burns, repetitive motions, flying metal shavings, fires, congested work areas, sharp edges |

Major Work Activity D - Performs maintenance and upgrading

Task D-13 Decommissions, disassembles and removes structural, ornamental mechanical and miscellaneous components

Task Descriptor

Before disassembly and removal tasks can begin, ironworkers (structural/ornamental) must be sure that it is safe to do so, by verifying that decommissioning has been performed and documented. It is critical that systems are first decommissioned, de-energized and locked out prior to disassembly work. Once this is confirmed, ironworkers (structural/ornamental) disassemble and remove structural, mechanical and miscellaneous components.

D-13.01 Ensures decommissioning of structure and components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| D-13.01.01P | determine need for lockout and de-energizing procedures | need for lockouts and equipment de-energization is determined to prevent injury and damage, according to company policies, and jurisdictional health and safety regulations |
| D-13.01.02P | review decommissioning documentation and keep records | decommissioning documentation and records are kept according to company policies and procedures, and jurisdictional health and safety regulations |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|--|
| D-13.01.01L | demonstrate knowledge of decommissioning requirements | a. identify policies and procedures for lockout and tagout of equipment b. identify sequence of decommissioning c. identify documentation requirements for decommissioning |
| D-13.01.02L | demonstrate knowledge of training and certification requirements to perform lockout and tagout | a. identify training and certification requirements to perform lockout and tagout |
| D-13.01.03L | demonstrate knowledge of regulatory requirements pertaining to lockout and tagout | a. identify codes, standards and regulations pertaining to lockout and tagout |

D-13.02 Disassembles structural, ornamental, mechanical and miscellaneous components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|---|
| D-13.02.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| D-13.02.02P | participate in lockout, tagout and de-energizing procedures | equipment is de-energized, locked out and tagged out to prevent injury and damage, according to company policies and procedures, and jurisdictional health and safety regulations |
| D-13.02.03P | plan sequence of disassembly | sequence of disassembly is planned according to industry standards and engineering specifications |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---|--|
| D-13.02.04P | assess need for rigging | need for rigging is assessed according to task and industry standards |
| D-13.02.05P | assess need for falsework | need for falsework is assessed according to task, industry standards, and engineering specifications |
| D-13.02.06P | remove structural , ornamental, mechanical and miscellaneous components | components are removed using various methods according to task, drawings and industry standards |
| D-13.02.07P | organize pieces for disposal, recycling and re-use | pieces are organized for disposal, recycling and re-use according to task, company policies and procedures, and jurisdictional regulations |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|---|
| structural components | columns, beams, joists, decking, girts, purlins, clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers, bracing |
| miscellaneous components | stairs, railings, coverings, grating, decking, catwalks, joist reinforcing, canopies, roof screens, solar screens, building signage, parapet walls, elevator divider beams/hoist beams, doors, windows, access ladders, roof openings, public art |
| methods | cutting free components using equipment (thermal and mechanical), removing fasteners |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|--|---|
| D-13.02.01L | demonstrate knowledge of procedures to remove structural , ornamental, mechanical and miscellaneous components | <ul style="list-style-type: none"> a. identify tools and equipment used to remove structural, ornamental, mechanical and miscellaneous components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to removing structural, mechanical and miscellaneous components c. assess stored energy and dynamic loads within structure d. describe procedures to remove structural, mechanical and miscellaneous components e. identify sequence of disassembly f. describe procedures to organize and store components for disposal, recycling and re-use |

Range of Variables (include, but not limited to)

| | |
|---------------------------------|---|
| structural components | columns, beams, joists, decking, girts, purlins, clip angles, sag rods, stiffeners, splice plates, wrap plates, shims, plate washers, bracing |
| miscellaneous components | stairs, railings, coverings, grating, decking, catwalks, joist reinforcing, canopies, roof screens, solar screens, building signage, parapet walls, elevator divider beams/hoist beams, doors, windows, access ladders, roof openings, public art |
| hazards | crush and pinch points, stored energy, falls, structural failure, electrocution, hazardous materials, sharp edges, working at heights, overloading hoisting and positioning equipment, unknown load weights, congested work areas, awkward positioning, burns, wind, skin irritants, respiratory particulates |

Task D-14 Maintains and repairs components

Task Descriptor

Ironworkers (structural/ornamental) assess the condition, repair, reinforce, and perform preventative maintenance of structural, ornamental, mechanical and miscellaneous components.

D-14.01 Assesses current condition of components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| D-14.01.01P | select and use diagnostic tools | diagnostic tools are selected and used according to task |
| D-14.01.02P | confirm components meet specifications | confirm components meet specifications using various methods according to manufacturers' specifications, and company policies and procedures |
| D-14.01.03P | identify and communicate observed defects | observed defects are identified and communicated with engineer of record (EOR), inspectors, supervisor and owner/client according to drawings and specifications |

Range of Variables (include, but not limited to)

| | |
|-------------------------|---|
| diagnostic tools | calipers, micrometers, torque wrenches, feeler gauges, depth gauges, ultrasonic testers, tape measure, surveying equipment (e.g., lasers, total station, levels, string lines, theodolite, plumb bob) |
| methods | visual inspection, dimensional inspection, non-destructive testing, using diagnostic tools |
| defects | distortion (e.g., incorrect sweep and camber, twisting, bending, heat distortion), fabrication errors, cracks, excessive wear, excessive rust, contamination, out of tolerance |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|--|--|
| D-14.01.01L | demonstrate knowledge of procedures to assess components | <ul style="list-style-type: none">a. identify diagnostic tools and equipment used to assess components, and describe their procedures for useb. describe methods to assess componentsc. identify hazards, and describe safe work practices pertaining to assessing components |

Range of Variables (include, but not limited to)

| | |
|-------------------------|---|
| diagnostic tools | calipers, micrometers, torque wrenches, feeler gauges, depth gauges, ultrasonic testers, tape measure, surveying equipment (e.g., lasers, total station, levels, string lines, theodolite, plumb bob) |
| methods | visual inspection, dimensional inspection, non-destructive testing, using diagnostic tools |
| hazards | working at heights, pinch and crush points, confined space, skin irritants, respiratory particulates, noise, toxins, hazardous materials |

D-14.02 Performs repairs, revisions and reinforcing of components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|--|
| D-14.02.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| D-14.02.02P | lay out components for field-fabrication and repair | components are laid out for field-fabrication and repair according to task, drawings and codes |
| D-14.02.03P | field-fabricate components | components are field-fabricated using various methods according to task, drawings and industry standards |
| D-14.02.04P | assemble components | components are assembled using various methods according to task, drawings, industry standards and manufacturers' specifications |
| D-14.02.05P | perform repair, revision and reinforcing procedures | repair, revision and reinforcing procedures are performed according to task, drawings, industry standards and manufacturers' specifications |
| D-14.02.06P | finish components | components are finished according to task, drawings, industry standards and manufacturers' specifications |
| D-14.02.07P | verify conditions of repair, revision and reinforcing | conditions of repair, revision and reinforcing are verified according to task, drawings, industry standards and manufacturers' specifications |

Range of Variables (include, but not limited to)

| | |
|--|--|
| tools and equipment | grinder, welding equipment, heating equipment, hand, power and layout tools, jigs |
| methods | welding, using mechanical fasteners, using adhesives |
| repair, revision and reinforcing procedures | heating, welding, wear plate replacement, hard surfacing |
| finishing | applying coatings (e.g., priming, painting, hot galvanizing, cold galvanizing, metalizing) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|-----------------------|--|--|
| D-14.02.01L | demonstrate knowledge of procedures for repair, revision and reinforcing | <ul style="list-style-type: none"> a. identify tools and equipment used for repair, revision and reinforcing of components, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to repair, revision and reinforcing c. describe layout techniques d. describe repair, revision and reinforcing procedures e. describe finishing methods f. describe procedures to inspect repaired, revised and reinforced components |

Range of Variables (include, but not limited to)

| | |
|--|--|
| tools and equipment | grinder, welding equipment, heating equipment, hand, power and layout tools, jigs |
| hazards | working at heights, pinch and crush points, confined space, skin irritants, toxic fumes, respiratory particulates, noise, fires, burns, flying debris, heavy lifting, awkward positioning, arc flash |
| repair, revision and reinforcing procedures | heating, welding, wear plate replacement, hard surfacing |
| finishing | applying coatings (e.g., priming, painting, hot galvanizing, cold galvanizing, metalizing) |

D-14.03 Replaces components

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|--|---|
| D-14.03.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| D-14.03.02P | install temporary and permanent supports | temporary and permanent supports are installed according to task, drawings, industry standards and manufacturers' specifications |
| D-14.03.03P | remove defective components | defective components are removed according to task, drawings, industry standards, manufacturers' specifications, client directive, and company policies and procedures |
| D-14.03.04P | install replacement components | replacement components are installed using methods according to task, drawings, industry standards and manufacturers' specifications |
| D-14.03.05P | finish installed components | installed components are finished using finishing procedures according to task, drawings, industry standards and manufacturers' specifications |

Range of Variables (include, but not limited to)

| | |
|-----------------------------|--|
| defective | distortion (e.g., incorrect sweep and camber, twisting, bending, heat distortion), fabrication errors, cracks, excessive wear, excessive rust, contamination, displacement |
| methods | welding, using mechanical fasteners, using adhesives |
| finishing procedures | applying coatings (e.g., priming, painting, hot galvanizing, cold galvanizing, metalizing) |

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|---|
| D-14.03.01L | demonstrate knowledge of procedures to replace components | a. identify tools and equipment used to replace components, and describe their procedures for use b. identify hazards , and describe safe work practices pertaining to replacing components c. describe procedures to replace components d. describe finishing procedures e. describe procedures to inspect replaced components |

Range of Variables (include, but not limited to)

| | |
|-----------------------------|---|
| hazards | working at heights, pinch and crush points, confined space, skin irritants, respiratory particulates, noise, fires, burns, flying debris, heavy lifting, awkward positioning, arc flash |
| finishing procedures | applying coatings (e.g., priming, painting, hot galvanizing, cold galvanizing, metalizing) |

D-14.04 Performs preventative maintenance

| | | | | | | | | | | | | |
|----|-----|----|-----|----|-----|----|-----|-----|----|----|----|----|
| NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| NV | yes | NV | yes | NV | yes | ND | yes | yes | ND | ND | ND | ND |

Skills

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|------------------------------------|--|
| D-14.04.01P | select and use tools and equipment | tools and equipment are selected and used according to task |
| D-14.04.02P | follow maintenance schedules | maintenance schedules are followed according to manufacturing specifications', client directive, and company policies and procedures |

| Reference Code | Performance Criteria | Evidence of Attainment |
|----------------|---------------------------------------|---|
| D-14.04.03P | perform maintenance techniques | maintenance techniques are performed according to task, manufacturing specifications', industry standards, and company policies and procedures |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| maintenance techniques | reinforcing, lubrication, hard surfacing, changing wear plates, re-aligning |
|-------------------------------|---|

Knowledge

| Reference Code | Learning Outcomes | Learning Objectives |
|----------------|---|--|
| D-14.04.01L | demonstrate knowledge of mechanical components that require preventative maintenance, their characteristics, applications and operation | <ul style="list-style-type: none"> a. identify mechanical components, and describe their characteristics, applications and operations b. interpret information pertaining to preventative maintenance found on drawings, manufacturers' specifications and maintenance schedules |
| D-14.04.02L | demonstrate knowledge of procedures to perform preventative maintenance | <ul style="list-style-type: none"> a. identify tools and equipment used to perform preventative maintenance, and describe their procedures for use b. identify hazards, and describe safe work practices pertaining to performing preventative maintenance c. describe maintenance techniques d. describe procedures to inspect components during preventative maintenance |

Range of Variables (include, but not limited to)

| | |
|-------------------------------|---|
| hazards | working at heights, pinch and crush points, confined space, skin irritants, respiratory particulates, noise, fires, burns, flying debris, heavy lifting, awkward positioning, arc flash, stored energy, electrocution |
| maintenance techniques | reinforcing, lubrication, hard surfacing, changing wear plates, re-aligning |

Appendix A - Acronyms

| | |
|--------|--|
| ANSI | American National Standards Institute |
| ASTM | American Society of Testing and Materials |
| BIM | Building Information Modeling |
| CAD | computer-aided design |
| CCUS | carbon capture, utilization and storage |
| CISC | Canadian Institute of Steel Construction |
| CLT | cross-laminated timber |
| CNC | computer numerical controlled |
| CNZEAA | Canadian Net-Zero Emissions Accountability Act |
| CSA | Canadian Standards Association |
| CWB | Canadian Welding Bureau |
| DEP | dedicated evacuation platform |
| DLT | dowel laminated timber |
| EAP | employee assistance plan |
| EDM | electronic distance measuring |
| EOR | engineer of record |
| EWO | extra work order |
| FCAW | flux core arc welding |
| FLRA | field-level risk assessments |
| FRP | fiber-reinforced polymers |
| GFRP | glass-fiber reinforced polymers |
| GLT | glue laminated timber (glulam) |
| GMAW | gas metal arc welding |
| GTAW | gas tungsten arc welding |
| ICF | insulated concrete form |
| IEP | individual education plan |
| ISO | International Organization for Standardization |
| JHA | job hazard analysis |
| LEED | Leadership in Energy and Environmental Design |
| LPG | liquid propane gas |
| MEWP | mobile elevating work platform |
| MSI | musculoskeletal injury |
| NECB | National Energy Code of Canada for Buildings |
| NLT | nail and dowel laminated timber |
| OHS | Occupational Health and Safety |

| | |
|-------|--|
| PAC | plasma arc cutting |
| PPE | personal protective equipment |
| PTI | Post Tensioning Institute |
| QA | quality assurance |
| RFI | requests for information |
| SCBA | self-contained breathing apparatus |
| SDS | Safety Data Sheets |
| SMAW | shielded metal arc welding |
| SPMT | self-propelled modular transporter |
| SRL | self-retracting lifeline |
| TC | tension control |
| TDG | Transportation of Dangerous Goods |
| THA | task hazard analysis |
| UV | ultra-violet |
| WHMIS | Workplace Hazardous Materials Information System |
| WLL | working load limits |
| ZCB | Zero Carbon Building |
| ZEV | zero-emission vehicles |

Appendix B - Tools and Equipment / Outils et équipement

Personal Protective Equipment (PPE) and Safety Equipment / Équipement de protection individuelle et équipement de sécurité

| | |
|---|--|
| air movers (fans) | appareils aérauliques (ventilateurs) |
| anchor points | points d'ancrage |
| arm guards | brassards |
| barriers | barrières |
| beam walkers (beamer, beam anchor, beam slider) | supports de poutre (ourdissoirs, ancrages de poutre, glissoires de poutre) |
| breathable air pack | appareil de protection respiratoire |
| chin straps | mentonnière |
| coveralls (fire retardant) | combinaison (ignifuge) |
| dedicated evacuation platform (DEP box) | plateformes d'évacuation dédiée |
| dog leash (cable anchor) | ancrages de câble |
| dowel protection | capuchon de protection pour goujon |
| ear plugs | bouchons d'oreille |
| eye wash facilities | dispositifs de rinçage oculaire d'urgence |
| face shields | écran facial |
| fall protection equipment | équipement de protection antichute |
| fire blankets | couvertures ignifuges |
| fire extinguishers | extincteurs |
| fire-retardant clothing | vêtement ignifuge |
| first aid equipment | équipement de premiers soins |
| full body harness | harnais complet |
| fume and toxic gas detector | détecteur de fumée et de gaz toxique |
| fume extractors (smoke eaters) | extracteurs de fumée |
| gloves | gants |
| goggles | lunettes étanches |
| guard rails | garde-corps |
| hard hat | casque de sécurité |
| hearing protection | protection auditive |

| | |
|--|--|
| high-visibility clothing | vêtement à haute visibilité |
| impalement protection | protection contre l'empalement |
| knee pads | genouillères |
| lanyards | cordes de retenue |
| life lines (self retracting, leading edge) | cordage de sécurité |
| lock-out kit | trousse de verrouillage |
| perimeter cables | câbles périphériques |
| portable lighting | éclairage portatif |
| protective wristlets | bracelets protecteurs |
| rescue system | systèmes de sauvetage |
| respirators | respirateurs |
| retractable lanyard | cordon d'assujettissement |
| rope grabs | coulisseau de sécurité |
| safety barriers | barrières de sécurité |
| safety belt | ceinture de travail |
| safety glasses | lunettes de protection |
| safety nets | filets de sécurité |
| safety vest (high visibility) | gilet de sécurité |
| screens | écrans |
| self-contained breathing apparatus (SCBA) | appareil de protection respiratoire autonome |
| self-retracting lifeline (SRL) | cordes de sécurité autorétractables |
| signage | signalisation |
| smoke and fume extractors | extracteurs de fumée et de vapeurs |
| stanchion posts | colonnettes |
| steel toed boots | bottes à embout d'acier |
| sunscreen | écran solaire |
| tool lanyard | longes à outils |
| warning tape | ruban indicateur |
| welding apron | tablier de soudeur |
| welding flash screens | écrans de soudeur |
| welding gloves | gants de soudeur |
| welding helmet | casques de soudeur |
| welding hoods | masques de soudeur |
| welding jacket | gilet de soudeur |
| welding shield | écran de soudage |

Hand Tools / Outils à main

| | |
|-------------------------------------|--|
| adjustable wrench | clés réglables |
| aligning bar (sleeve bar) | barre d'alignement |
| B&O hammer | marteau poinçon de recul |
| bar clamps | serre-joint à barre |
| bars | barres |
| beam clamps | attache-support |
| bolt bag | sac à boulons |
| bolt cutters | coupe-boulons |
| bridge clamps | pincés de pont |
| button punch (crimper) | pincés à crever (pincés à sertir) |
| cable cutters | pincés coupe-câbles |
| centre punch | pointeau à centrer |
| chalk line | cordeau traceur |
| chipping hammer | marteau à buriner |
| cold chisel | ciseaux à froid |
| combination square | équerre combinée |
| combination wrench set | jeu de clés mixtes |
| drill bits | forets |
| files | limes |
| flashlight | lampe torche |
| grease gun | pistolet graisseur |
| hack saw | scie à métaux |
| hammer wrench (slug wrench) | clé à frapper |
| hammers | marteaux |
| hex keys | clé hexagonales |
| hoses (hydraulic, pneumatic, water) | tuyaux (coule, pneumatique, eau) |
| knives | couteaux |
| marlinspike | poinçon à épissier |
| measuring tape | ruban à mesurer |
| needle nose pliers | pincés à becs pointus |
| nose bag | sacs à outils |
| nut drivers | tournevis à douille |
| pins (drift, bull, tapered) | goupilles (broches d'assemblage, clavettes, conique) |
| pipe cutters | coupe-tube |

| | |
|------------------------|---|
| pipe wrench | clés à tuyaux |
| pliers | pinces |
| prybar | levier |
| punch | pointeau |
| reamers | alésoirs |
| scrapers | grattoirs |
| screwdrivers | tournevis |
| shears | cisailles |
| side/diagonal cutters | cisailles à tranchant latéral et coupe transversale |
| sledgehammer (beaters) | masses (batteurs) |
| slips joint pliers | pinces à joint coulissant |
| socket set | jeu de douilles |
| spud wrench | clé à mâchoires |
| tap set | jeu de tarauds |
| tarps | bâches |
| tin snips | cisailles de ferblantier |
| tool belt | ceinture à outils |
| tool bucket | seau à outils |
| welding pick | pic à souder |
| wire brush | brosse métallique |

Power Tools and Equipment / Outils et équipement mécanique

| | |
|--|--|
| air chisel | burin pneumatique |
| band saw | scie à ruban |
| battery powered cut off saw | tronçonneuses à pile |
| benders | cintreuse |
| chop saw | scie à tronçonner |
| circular saw | scie à lame circulaire |
| compressor | compresseur |
| die grinder (pencil grinder) | meule à rectifier les matrices (meuleuse-crayon) |
| electric cut-off saws | scies à tronçonner électriques |
| electric hacksaw | scie électrique à métaux |
| gas and battery powered quick-cut saws | scies à coupe rapide à essence et |

| | |
|-----------------------------------|---|
| gas cut-off saw | électriques |
| generator | scie à tronçonner à essence |
| grinder | génératrice |
| hammer drill | meuleuse |
| hydraulic jacks (and accessories) | marteau perforateur |
| impact drill | vérins hydrauliques (et accessoires) |
| impact gun | perceuse électrique |
| magnetic drill | pistolet cloueur |
| peening tool | perceuse magnétique |
| percussion drill | outil de martelage |
| pneumatic gun | perceuse à percussion |
| portable band saw | pistolet pneumatique |
| powder-actuated tool | scie portative |
| power bender | fixateur à cartouches |
| power cords | cintreuse électrique |
| power drill | cordons d'alimentation |
| power shears | perceuse électrique |
| power wrench | cisailles mécaniques |
| reciprocating saw | perceuse magnétique |
| rivet buster | scie alternative |
| riveting gun | coupe-rivet |
| rotary tools | pistolet à riveter |
| tension control gun | outils rotatifs |
| torquing and tensioning tools | pistolet à serrage dynamométrique |
| | outils et serrage au couple et de tensionnement |

Measuring and Layout Equipment / Équipement de mesure et de traçage

| | |
|----------------|---------------------|
| angle finder | détecteur d'angle |
| bevel squares | fausse équerre |
| builders level | niveau de bâtisseur |
| chalk | craie |
| chalk line | cordeau traceur |
| crayon | crayon pinceau |

| | |
|--|--|
| digital level | niveau numérique |
| distometers (Electronic Distance Measurement Instrument [EDM]) | distomètre (télémètres électroniques) |
| folding rules | règles pliantes |
| laser level | niveau laser |
| laser square | équerre au laser |
| line level | niveau de cordeau |
| measuring chain | chaîne de mesure |
| measuring tape | ruban à mesurer |
| paint pen | stylo de peinture |
| pencil | crayon de plomb |
| piano wire | fil à piano |
| plumb line/bob | fil à plomb |
| prism | prisme |
| scale | échelle de mesure |
| scriber | pointe à tracer |
| soapstone | stéatite |
| spirit levels | niveau à bulle |
| spray paint | peinture au pistolet |
| squares (framing, combination) | équerre (combinée, de charpentier) |
| steel rules | règle en acier |
| straight edges | règles de vérification |
| string line | cordeau |
| survey rod (Philadelphia rod) | mires de nivellement (tiges de Philadelphie) |
| tape measures | rubans à mesurer |
| theodolite | théodolite |
| torpedo level | niveau torpille |
| total station | tachéomètre électronique |
| transit | théodolite réitérateur |
| tripods | trépied |
| water level | niveau à eau |

Specialty Tools and Equipment (Welding and Cutting Tools) / Outils et équipement spécialisés (outils de soudage et de coupage)

| | |
|--|--|
| air lance | lance à air |
| arc air (gouger) | appareil de gougeage arc-air |
| chipping hammer | marteau à buriner |
| compressed gas cylinders | bouteilles |
| flux core arc welding (FCAW) equipment | équipement de soudage à l'arc avec fil fourré (FCAW) |
| gas metal arc welding (GMAW) equipment | équipement de soudage à l'arc sous gaz avec fil plein (GMAW) |
| gas tungsten arc welding (GTAW) equipment | équipement de soudage à l'arc sous gaz avec électrode de tungstène (GTAW) |
| generator-powered welding equipment | équipement de soudage à génératrice |
| mirrors | miroirs |
| oxy-fuel cutting tools | outils d'oxycoupage |
| plasma arc cutting (PAC) | torche de coupage au jet de plasma |
| radiograph | radiogramme |
| rod oven | fours à baguettes |
| rosebud torch | chalumeau à buse multiflamme |
| shielded metal arc welding (SMAW) | équipement de soudage à l'arc avec électrode enrobée (SMAW) |
| stub pail | chaudières à baguettes |
| stud welding equipment | équipement de soudage de goujons |
| submerged arc equipment | équipement de soudage à l'arc submergé |
| thermite welding equipment | appareil de soudage aluminothermique |
| tiger torch | buse de lance-flammes |
| welding rod quiver | boîtiers de baguettes |
| wire wheel | brosse métallique circulaire |

Specialty Tools and Equipment (for Building Envelope) / Outils et équipement spécialisés (pour enveloppe de bâtiment)

| | |
|------------------|--------------------------|
| caulking guns | pistolets à calfeutrer |
| glazing bar | fers à vitrage |
| insulation knife | couteaux à isolant |
| nibblers | grignoteuses |
| rivet gun | pistolets à riveter |
| screw guns | visseuses |
| shears | cisailles |
| stapler | marteaux agrafeurs |
| tin snips | cisailles de ferblantier |

Scaffolding and Access Equipment / Équipement d'accès et échafaudage

| | |
|--|---|
| angel's wings | nacelles de travail (Angel's Wings) |
| bosun chair | chaise de gabier |
| crane-supported personnel baskets | nacelles de personnel supportées par grue |
| floats | flotteurs |
| ladders (extension, stepladders) | échelles (à coulisse, escabeaux) |
| mobile elevating work platforms (MEWP) | plateformes aériennes élévatrices |
| personnel lifts/freight elevator | plateforme de levage de personnes et monte-charge |
| ramps | rampes |
| rope access equipment | équipement d'accès à cordon |
| scaffolds | échafaudages |
| scissor-lift | table élévatrice à ciseaux |
| swing stages | échafaudages volants |
| telehandlers | chargeurs à bras télescopique |

Rigging, Hoisting and Positioning Equipment / Équipement de gréage, de hissage et de positionnement

| | |
|---|---|
| air film technology (air casters/air bearings/floats) | technologie à film d'air (roulettes à air, roulements à air, flotteurs) |
| balance beam | poutre d'équilibre |
| beam clamps | attache-poutre |
| binders | tendeurs |
| blocks | moufles |
| cable clamps | serre-câbles |
| chain | chaîne |
| chain falls | palans à chaîne |
| chain hoist | palans manuels à chaîne |
| clips | agrafes |
| come-alongs | treuils pneumatiques |
| cradle | berceau |
| dunnage | dispositif de calage |
| equalizer beam | palonnier à un point d'ancrage |
| eye bolts | boulons à œil |
| fibre rope | câbles textiles |
| forklifts (all classes) including high capacity | chariots élévateurs à fourche |
| girder clamps (girder dogs) | selles de suspension |
| glass cups | ventouses |
| grip-action hoist | tire-câbles à rochet |
| guide lines | haubans |
| hooks (sorting, eye, swivel, chain grabs) | crochets (pipeline, fermés, à émerillon, barbotins) |
| hydraulic blade gripper | pincés à lame hydraulique |
| master link | maillons principaux |
| mechanical/hydraulic jacks | vérins mécaniques, hydrauliques |
| multi-bearing rollers | plaques à rouleaux multiples |
| multiple-leg bridle sling | chevalet de gréage en forme de patte d'oie |
| pallet jack | transpalette à main |
| panel lifting equipment | équipement de levage de panneaux |
| power cups | ventouses électriques |
| remote hook | crochets à distance |
| rollers | rouleaux |

| | |
|---|--|
| rolling hydraulic gantry systems | portiques roulants hydrauliques |
| rope clips | pinces à cordage |
| sawhorses | chevalets |
| self-propelled modular transporter (SPMT) | transporteurs modulaires autopropulsés |
| shackles | manilles |
| sheaves | poules |
| snatch block | moufles ouvrantes |
| softeners | adoucisseurs |
| spreader beam | élingues d'écartement |
| spreaders | écarteurs |
| swivel | émerillons |
| synthetic slings | élingues synthétiques |
| tackle blocks | palans à moufles |
| tag lines | câbles stabilisateurs |
| thimbles | cosses |
| tugger | palan à moteur |
| turnbuckles | culot à coin |
| wedge sockets | attaches à coin |
| winches | treuils |
| wire rope | câbles métalliques |
| wire rope slings | élingues métalliques |

Appendix C - Glossary / Glossaire

| | | | |
|--------------------------|---|------------------------------|--|
| building envelope | the physical separator between the conditioned and unconditioned environment of a building, including the resistance to air, water, heat, light, and noise transfer | enveloppe de bâtiment | séparateur physique entre l'environnement conditionné et non conditionné d'un bâtiment, y compris la résistance au transfert de l'air, de l'eau, de la chaleur, de la lumière et du bruit |
| curtain wall | a form of building envelope, normally produced as unitized panels of aluminum and glass, that is suspended entirely on the exterior of a building | mur-rideau | forme d'enveloppe de bâtiment, normalement produite sous forme de panneaux unifiés d'aluminium et de verre, entièrement suspendue à l'extérieur d'un bâtiment |
| drawings | a visual representation of a design, including sketches and illustrations (e.g., blueprints, sketches, structural, structural erection, architectural, engineered, detail, erection, precast shop, shop, weld procedures) | dessins | représentation visuelle d'une conception, y compris des croquis et des illustrations (par exemple, plans, croquis, structure, érection structurelle, architectural, ingénierie, détail, érection, atelier de préfabrication, atelier, procédures de soudage) |
| dunnage | wooden boards and timbers used to hold material in place when being transported or stored | dispositif de calage | planches et poutres de bois utilisées pour maintenir l'équipement en place lors du transport et de l'entreposage |
| falsework | temporary steel or wooden supports upon which structural components are erected or pre-assembled | ouvrage provisoire | supports temporaires en acier ou en bois sur lesquels les composants structurels sont érigés ou pré-assemblés |
| girts | horizontal or vertical framing member to which sash, siding or other finished material is attached | liernes | éléments de charpente horizontaux ou verticaux auxquels sont fixés les châssis, recouvrements et autres matériaux finis |

| | | | |
|----------------------------------|---|-------------------------------------|---|
| grating | an arrangement of parallel or latticed bars which serve as the floor of a platform, walkway, etc. | treillis | barres parallèles ou grillagées servant de plancher de plateforme, de passerelle, etc. |
| hoisting | raising, lowering and moving a rigged and suspended load. For the purpose of this standard, it includes lifting loads. | hissage | lever, abaisser et déplacer une charge grée et suspendue. Aux fins de cette norme, cela inclut le levage de charges |
| miscellaneous products | any product or component that is not a main structural supporting member (e.g., stairs, railings, canopies, solar screens, building signage, doors and wall supports) | produits divers | tout produit ou composant qui n'est pas un élément de support structurel principal (par exemple, escaliers, rampes, auvents, écrans solaires, signalisation de bâtiment, portes et supports muraux) |
| ornamental components | non-structural steel, precast or composite members | éléments ornementaux | pièces non structurales en acier, préfabriquées ou composites |
| positioning | moving rigged loads into position (other than vertical, which is considered hoisting) | positionnement | déplacer des charges grées en position (autre que verticale, ce qui est considéré comme un levage) |
| precast | concrete product that is fabricated and cast in a location different than its intended permanent location (normally offsite in a pre-cast yard). | béton préfabriqué | produit en béton fabriqué et coulé dans un endroit différent de son emplacement permanent prévu, normalement hors site dans un chantier de préfabrication |
| primary structural member | structural members essential to the overall integrity of the building or structure, such as columns, beams, girders, trusses, tie joists, footings, corbels and piers | élément structurel principal | éléments structurels essentiels à l'intégrité globale du bâtiment ou de la structure, tels que colonnes, poutres, poutres maîtresses, fermes, poutrelles de liaison, semelles, encorbellements et piliers |

| | | | |
|------------------------------------|--|--|---|
| secondary structural member | structural members that support themselves and transfer loading to primary structural members (e.g., infill walls, horizontal and vertical bracing, girts, purlins, flange braces, framed openings and joists) | élément structurel secondaire | éléments structurels qui se soutiennent eux-mêmes et transfèrent les charges aux éléments structurels principaux (par exemple, murs de remplissage, contreventements horizontaux et verticaux, liernes, pannes, contreventements à brides, poutres d'allège, ouvertures à charpente et solives) |
| steel cladding | corrugated sheet metal used in the building envelope | revêtement en acier | tôle ondulée utilisée dans l'enveloppe du bâtiment |
| thermal cutting equipment | equipment using either electric arc or catalyzed combustion of pressurized gasses to cut or gouge materials | équipement de coupage thermique | équipement utilisant soit un arc électrique, soit une combustion catalysée de gaz sous pression pour couper ou creuser des matériaux |
| window walls | a form of building envelope that may be stick-built or produced as unitized panels of aluminum and glass, that bears on a floor level and spans from that floor to the ceiling | rideau de verre | forme d'enveloppe de bâtiment qui peut être construite en bâtons ou produite sous forme de panneaux unifiés d'aluminium et de verre, qui repose sur un niveau de sol et s'étend de ce sol jusqu'au plafond |