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Red Seal Occupational Standard

Ironworker (Generalist)

INTERPROVINCIAL STANDARD
CANADA
NORME INTERPROVINCIALE

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Canada

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Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the Red Seal standard for the Ironworker (Generalist) 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
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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
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- Barry Chetyrbok – Manitoba
- Desi Chrapko – Alberta
- Caelen Zachary Dunkley – British Columbia
- Keith Fergus – Ontario
- Christopher Forsyth – Alberta
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- Clinton Knowlton – Ontario
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- Charles Richard – New Brunswick
- Kirk Sampson – Nova Scotia
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- 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 (Generalist) Trade: an overview of the trade's duties, work environment, job requirements, similar occupations and career progression

Trends in the Ironworker (Generalist) 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 journeyperson 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 Not Validated by that province or territory
ND	trade Not Designated 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 (Generalist) Trade

“Ironworker (Generalist)” is this trade’s official Red Seal occupational title approved by the CCDA. This analysis covers tasks performed by ironworkers (generalist).

Ironworkers (generalist) work with both structural/ornamental and reinforcing steel materials. They install structural/ornamental steel components, precast concrete members and mass timber products such as glue laminated timber (glulam), cross laminated timber (CLT), and nail and dowel laminated timber (NLT & DLT). They place reinforcing steel 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 (generalist) also install conveyors, machinery, and automated material handling systems. They are also involved in demolition and salvage duties involving all types of construction.

Ironworkers (generalist) cut, bend, lay out, hoist, place, tie, couple, and weld reinforcing steel bars, welded wire fabric and composite materials in a wide variety of reinforced concrete products and structures such as buildings, highways, bridges, stadiums, wind turbines, solar panels, power-generating plants, and towers. While the reinforcing material is usually pre-cut and fabricated off-site, ironworkers (generalist) may be called upon to cut and bend them in the field according to design specifications and drawings. Ironworkers (generalist) may pre-assemble reinforcing material by laying it out and connecting sub-assemblies on the ground prior to final placement. They organize the hoisting of the components by choosing and installing rigging such as cables and slings to the components and directing crane operators. They position, align and secure components according to drawings, using a variety of methods. After placing post-tensioning systems, they stress the tendons to predetermined forces using hydraulic jacks and pumps and then may grout the tendons according to the system.

Ironworkers (generalist) prepare the construction site by assembling the hoisting equipment. They unload reinforcing materials, structural and ornamental components, and organize the material for installation and hoisting. They organize and sequence the hoisting of the components by connecting rigging (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 (generalist) 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 repetitive motions, electrocution, falls or falling objects, lacerations, pinch points, crushing and overexertion. Ironworkers (generalist) typically work a 40-hour week; however, inclement weather such as rain, snow or high winds may shut down projects for extended periods and alternate deadlines and priorities

may require overtime hours.

Ironworkers (generalist) are required to have good mechanical aptitude, the ability to lift heavy objects, the ability to maintain balance working at heights in various conditions, 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 (generalist) 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 (generalist) is workplace safety. They must be thoroughly familiar with the applicable sections of local, provincial and federal building and safety standards.

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

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

Ironworkers (generalist) 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. Ironworkers may use wearable technology, RFID, and QR codes for tracing materials and monitoring the health and safety of workers. Digital technologies and software can help ironworkers (generalist) 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 (generalist) 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 (generalist) that can protect them from lacerations, 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 (generalist) to move materials and equipment.

There is a greater variety of mobile equipment used by ironworkers (generalist) such as rough terrain forklifts, mini cranes and mobile elevating work platforms. 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 and installation of components such as robotic tying machines and tying guns.

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 insulated concrete form (ICF), 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 (generalist) may also need to work with specialty rebar, 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 (generalist).

The design of structures exposed to seismic and cyclic loading is constantly evolving and ironworkers (generalist) 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 (generalist) 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 (generalist) 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 (generalist) 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, standards and limitations, welding is an important skill for many ironworkers (generalist), as they need to form structures and components from metal pieces. Ironworkers (generalist) 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 (generalist) will be required to stay up-to-date 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 (generalist) 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 (generalist) 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, reinforcing materials and structures.

Writing

Ironworkers (generalist) may write work-related notes 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 (generalist) 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 (generalist), crane operators, other workers and supervisors during hazardous activities, such as connecting, hoisting and installing steel, steel reinforced structures and reinforcing material.

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

Numeracy

Ironworkers (generalist) 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 and reinforcing materials. They also compare their measurements to the specifications to ensure steel columns, bars, 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 (generalist) 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 (generalist) 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 (generalist) to be computer-literate. Ironworkers (generalist) 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 (generalist) 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 (generalist) 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 (generalist) 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 (generalist) to gain new expertise is to learn on the job from more experienced co-workers, mentors or supervisors. It is common for ironworkers (generalist) to also have a welding certification and a post tensioning 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.

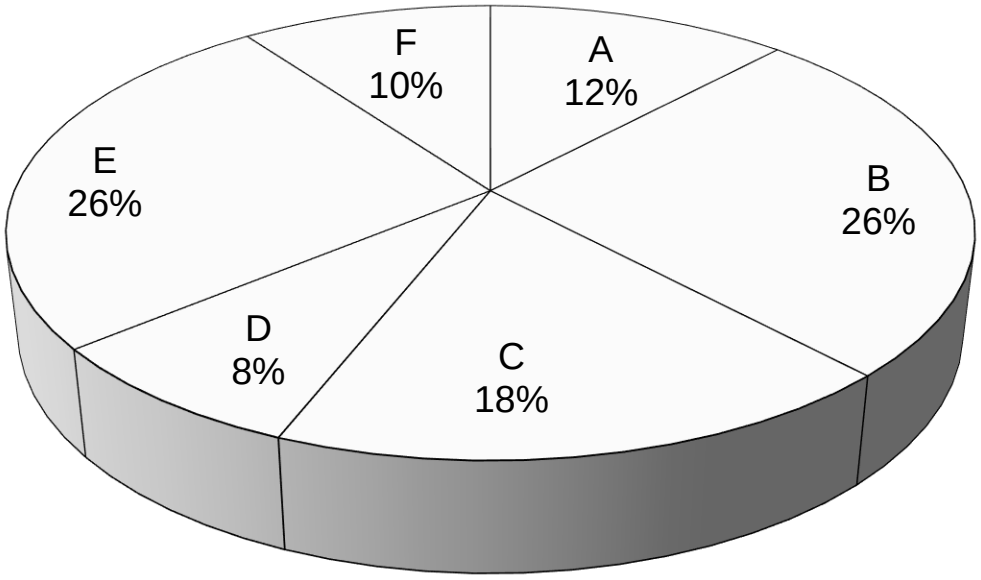
Industry Expected Performance

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	12%
B - Performs rigging, hoisting and positioning, and mobilization, erection, and demobilization of cranes	26%
C - Fabricates and installs reinforcing materials	18%
D - Performs pre-stressing/post-tensioning	8%
E - Performs erection, assembly and installation	26%
F - Performs maintenance and upgrading	10%

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 12%

Task A-1 Maintains safe and healthy workplace 28%	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 38%	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 bending tools and equipment
	Sub-task A-2.04 Uses powder-actuated tools	Sub-task A-2.05 Uses mobile elevating work platforms (MEWP)	Sub-task A-2.06 Uses material handling equipment
	Sub-task A-2.07 Uses ladders	Sub-task A-2.08 Uses scaffolding	Sub-task A-2.09 Uses surveying equipment
	Sub-task A-2.10 Uses welding equipment	Sub-task A-2.11 Uses mechanical cutting equipment	Sub-task A-2.12 Uses thermal cutting equipment
Organizes work Task A-3 24%	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
	Sub-task A-3.04 Plans tasks		

Task A-4 Maintains continuous learning 5%	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 5%	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 26%

Task B-6 Plans lift 24%	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 35%	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 20%	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 21%	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 - Fabricates and installs reinforcing material 18%

Task C-10 Fabricates reinforcing materials on-site 34%	Sub-task C-10.01 Cuts reinforcing materials	Sub-task C-10.02 Bends reinforcing materials	
Task C-11 Installs reinforcing materials 66%	Sub-task C-11.01 Places reinforcing materials	Sub-task C-11.02 Ties reinforcing materials	Sub-task C-11.03 Splices reinforcing materials

D - Performs pre-stressing/post-tensioning 8%

Task D-12 Places pre-stressed/post-tensioning systems 57 %	Sub-task D-12.01 Lays out profile	Sub-task D-12.02 Places tendons and accessories	Sub-task D-12.03 Installs bursting steel and anchorages
	Sub-task D-12.04 Connects tendons to anchorages	Sub-task D-12.05 Protects exposed tendons	
Task D-13 Stresses tendons 30%	Sub-task D-13.01 Sets up stressing equipment	Sub-task D-13.02 Tensions tendons	Sub-task D-13.03 Cuts and caps tendons
	Sub-task D-13.04 Removes stressing equipment	Sub-task D-13.05 De-stresses tendons	
Task D-14 Grouts tendons 13%	Sub-task D-14.01 Sets up grouting equipment	Sub-task D-14.02 Installs grout	

E - Performs erection, assembly and installation 26%

Task E-15 Installs primary and secondary structural members 51 %	Sub-task E-15.01 Uses falsework	Sub-task E-15.02 Attaches structural members	Sub-task E-15.03 Levels, plumbs and aligns structural members
	Sub-task E-15.04 Completes installation of structural members		
Task E-16 Installs ornamental, miscellaneous, and steel cladding systems and components 26%	Sub-task E-16.01 Installs curtain walls and window walls	Sub-task E-16.02 Installs miscellaneous components	Sub-task E-16.03 Installs steel cladding, and building envelope systems and components
Task E-17 Installs conveyors, machinery and equipment 23%	Sub-task E-17.01 Installs material handling systems	Sub-task E-17.02 Performs alignment and commissioning of material handling systems	

F - Performs maintenance and upgrading 10%

Task F-18 Decommissions, disassembles and removes structural, ornamental, mechanical and miscellaneous components 60%	Sub-task F-18.01 Ensures decommissioning of structure and components	Sub-task F-18.02 Disassembles structural, ornamental, mechanical and miscellaneous components	
Task F-19 Maintains and repairs components 40%	Sub-task F-19.01 Assesses current condition of components	Sub-task F-19.02 Performs repairs, revisions and reinforcing of components	Sub-task F-19.03 Replaces components
	Sub-task F-19.04 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 (Generalist).

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	Tools and Equipment	Tools and Equipment
2.01 Uses hand tools and measuring tools 2.02 Uses power tools 2.03 Uses bending tools and equipment 2.04 Uses powder-actuated tools 2.05 Uses mobile elevating work platforms (MEWP) 2.06 Uses ladders 2.07 Uses material handling equipment 2.08 Uses scaffolding 2.09 Uses surveying equipment 2.10 Uses welding equipment 2.11 Uses mechanical cutting equipment 2.12 Uses thermal cutting equipment	2.03 Uses bending tools and equipment 2.09 Uses surveying equipment 2.10 Uses welding equipment 2.12 Uses thermal cutting equipment	2.09 Uses surveying equipment 2.10 Uses welding equipment 2.12 Uses thermal cutting equipment
Organizes Work	**Organizes Work**	**Organizes Work**
3.01 Organizes materials and supplies 3.02 Performs layout 3.03 Uses drawings and documentation 3.04 Plans tasks	3.01 Organizes materials and supplies 3.02 Performs layout 3.03 Uses drawings and documentation 3.04 Plans tasks	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		**Mentoring**
5.01 Uses communication techniques		5.02 Uses mentoring techniques

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

Onsite Fabrication of Reinforcing Materials 10.01 Cuts reinforcing materials 10.02 Bends reinforcing materials	**Onsite Fabrication of Reinforcing Materials** 10.01 Cuts reinforcing materials 10.02 Bends reinforcing materials	**Onsite Fabrication of Reinforcing Materials** 10.01 Cuts reinforcing materials 10.02 Bends reinforcing materials
Installation of Reinforcing Materials 11.01 Places reinforcing materials 11.02 Ties reinforcing materials 11.03 Splices reinforcing material	**Installation of Reinforcing Materials** 11.01 Places reinforcing materials 11.02 Ties reinforcing materials 11.03 Splices reinforcing material	**Installation of Reinforcing Materials** 11.01 Places reinforcing materials 11.02 Ties reinforcing materials 11.03 Splices reinforcing material
Pre-Stressing/Post-Tensioning 12.01 Lays out profile 12.02 Places tendons and accessories 12.03 Installs bursting steel and anchorages 12.04 Connects tendons to anchorages 12.05 Protects exposed tendons	**Pre-Stressing/Post-Tensioning** 12.01 Lays out profile 12.02 Places tendons and accessories 12.03 Installs bursting steel and anchorages 12.04 Connects tendons to anchorages 12.05 Protects exposed tendons	**Pre-Stressing/Post-Tensioning** 12.01 Lays out profile 12.02 Places tendons and accessories 12.03 Installs bursting steel and anchorages 12.04 Connects tendons to anchors 12.05 Protects exposed tendons
Stressing Tendons 13.01 Sets up stressing equipment 13.02 Tensions tendons 13.03 Cuts and caps tendons 13.04 Removes stressing equipment 13.05 De-stresses tendons	**Stressing Tendons** 13.01 Sets up stressing equipment 13.02 Tensions tendons 13.03 Cuts and caps tendons 13.04 Removes stressing equipment 13.05 De-stresses tendons	**Stressing Tendons** 13.01 Sets up stressing equipment 13.02 Tensions tendons 13.03 Cuts and caps tendons 13.04 Removes stressing equipment 13.05 De-stresses tendons
Grouting Tendons 14.01 Sets up grouting equipment 14.02 Installs grout	**Grouting Tendons** 14.01 Sets up grouting equipment 14.02 Installs grouts	**Grouting Tendons** 14.01 Sets up grouting equipment 14.02 Installs grout

Installation of Primary and Secondary Structural Members 15.01 Uses falsework 15.02 Attaches structural members 15.03 Levels, plumbs and aligns structural members 15.04 Completes installation of structural members	**Installation of Primary and Secondary Structural Members** 15.01 Uses falsework 15.02 Attaches structural members 15.03 Levels, plumbs and aligns structural members 15.04 Completes installation of structural members	**Installation of Primary and Secondary Structural Members** 15.01 Uses falsework 15.02 Attaches structural members 15.03 Levels, plumbs and aligns structural members 15.04 Completes installation of structural members
Installation of Ornamental, Miscellaneous and Steel Cladding Components and Systems 16.01 Installs curtain walls and window walls 16.02 Installs miscellaneous components 16.03 Installs steel cladding and building envelope components and systems	**Installation of Ornamental, Miscellaneous and Steel Cladding Components and Systems** 16.01 Installs curtain walls and window walls 16.02 Installs miscellaneous components 16.03 Installs steel cladding and building envelope components and systems	**Installation of Ornamental, Miscellaneous and Steel Cladding Components and Systems** 16.01 Installs curtain walls and window walls 16.02 Installs miscellaneous components 16.03 Installs steel cladding and building envelope components and systems
	Installation of Conveyors, Machinery and Equipment 17.01 Installs material handling systems 17.02 Performs alignment and commissioning of material handling systems	**Installation of Conveyors, Machinery and Equipment** 17.01 Installs material handling systems 17.02 Performs alignment and commissioning of material handling systems
	Decommissioning, Disassembly and Removal of Structural, Ornamental, Mechanical and Miscellaneous Components 18.01 Ensures decommissioning of structure and components 18.02 Disassembles structural ornamental, mechanical and miscellaneous components	**Decommissioning, Disassembly and Removal of Structural, Ornamental, Mechanical and Miscellaneous Components** 18.01 Ensures decommissioning of structure and components 18.02 Disassembles structural ornamental, mechanical and miscellaneous components

Maintenance and Repair	Maintenance and Repair	Maintenance and Repair
19.01 Assesses current condition of components	19.01 Assesses current condition of components	19.01 Assesses current condition of components
19.02 Performs repairs and revisions of components	19.02 Performs repairs and revisions of components	19.02 Performs repairs and revisions of components
19.03 Replaces components	19.03 Replaces components	19.03 Replaces components
19.04 Performs preventative maintenance	19.04 Performs preventative maintenance	19.04 Performs preventative maintenance

Major Work Activity A - Performs common occupational skills

Task A-1 Maintains safe and healthy workplace

Task Descriptor

Ironworkers (generalist) 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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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, jurisdictional regulations, and 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

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	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	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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
A-1.03.05P	create plan to manage work-life balance	plan is created to manage work-life balance and discussed with supervisors

Reference Code	Performance Criteria	Evidence of Attainment
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	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

Reference Code	Learning Outcomes	Learning Objectives
A-1.03.02L	demonstrate knowledge of techniques to manage personal health and well-being	a. describe stress and time management techniques b. identify supports to manage health and well-being c. describe **techniques to manage health and wellness**
A-1.03.03L	demonstrate knowledge of professionalism and **professional ethics**	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	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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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 manufactures' 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	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	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	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	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 bending tools and equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.03.01P	select and use **bending tools and equipment**	**bending tools and equipment** are selected and used according to task and manufacturers' specifications
A-2.03.02P	set up **bending tools and equipment**	**bending tools and equipment** are set up according to manufacturers' specifications
A-2.03.03P	inspect and identify damaged, worn or unsafe **bending tools and equipment**, and remove from service	inspection is performed, and damaged, worn or unsafe **bending tools and equipment** are identified and removed from service according to manufactures' specifications, and company policies and procedures
A-2.03.04P	calibrate powered **bending tools and equipment**	powered **bending tools and equipment** are calibrated according to manufacturers' specifications
A-2.03.05P	clean, maintain and store **bending tools and equipment**	**bending tools and equipment** are cleaned, maintained and stored according to manufacturers' specifications and company policies and procedures

Range of Variables (include, but not limited to)

bending tools and equipment	hickey bars, hydraulic table-top benders, electric handheld benders

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
A-2.03.01L	demonstrate knowledge of **bending tools and equipment**, their characteristics, applications and operation	a. identify types of **bending tools and equipment**, and describe their characteristics and applications b. describe operating principles of **bending tools and equipment** c. interpret information pertaining to **bending tools and equipment** uses and limitations found in manufacturers' specifications
A-2.03.02L	demonstrate knowledge of procedures to use and maintain **bending tools and equipment**	a. identify **hazards**, and describe safe work practices pertaining to using and maintaining **bending tools and equipment** b. describe procedures to inspect, identify and repair or remove damaged, worn or unsafe **bending tools and equipment** from service c. describe procedures to clean, maintain and store **bending tools and equipment** d. describe procedures to calibrate **bending tools and equipment** e. describe procedures to dispose of damaged **bending tools and equipment**
A-2.03.03L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining **bending tools and equipment**	a. identify standards and regulations pertaining to using and maintaining **bending tools and equipment**

Range of Variables (include, but not limited to)

bending tools and equipment	hickey bars, hydraulic table-top benders, electric handheld benders
hazards	flying debris, pinch/crush points, cuts, punctures, overexertion, struck by tools, electrocution, hydraulic pressures, bending table

A-2.04 Uses powder-actuated tools

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.04.01P	select and use powder-actuated tools and **components**	powder-actuated tools and **components** are selected and used according to task and manufacturers' specifications
A-2.04.02P	select and use powder-actuated charges and fasteners	powder-actuated charges and fasteners are selected and used according to task and manufacturers' specifications
A-2.04.03P	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 manufactures specifications, and company policies and procedures
A-2.04.04P	clean and lubricate powder-actuated tools	powder-actuated tools are cleaned and lubricated according to manufacturers' recommendations and specifications
A-2.04.05P	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-2.04.06P	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-2.04.01L	demonstrate knowledge of powder-actuated tools, charges and fasteners, their **components**, characteristics, applications and operation	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-2.04.02L	demonstrate knowledge of procedures to use and maintain powder-actuated tools	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-2.04.03L	demonstrate knowledge of training and certification requirements to use and maintain powder-actuated tools	a. identify training and certification requirements to use and maintain powder-actuated tools
A-2.04.04L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining powder-actuated tools	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-2.05 Uses mobile elevating work platforms (MEWP)

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.05.01P	select mobile elevating work platforms (**MEWPs**) and **accessories**	**MEWPs** and **accessories** are selected according to task and manufacturers' specifications
A-2.05.02P	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-2.05.03P	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-2.05.04P	position **MEWPs**	**MEWPs** are positioned according to task, manufacturers' specifications and site conditions
A-2.05.05P	use **MEWPs**	**MEWPs** are used according to manufacturers' specifications, site-specific requirements, jurisdictional regulations, and company policies and procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.05.06P	store **MEWPs**	**MEWPs** are stored according to manufacturers' specifications, and company policies and procedures
A-2.05.07P	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-2.05.01L	demonstrate knowledge of **MEWPs**, their components, **accessories**, characteristics, applications, and operation	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-2.05.02L	demonstrate knowledge of procedures to use and maintain **MEWPs**	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** d. describe procedures to use **MEWPs** e. describe procedures to store **MEWPs** f. describe procedures to maintain **MEWPs**
A-2.05.03L	demonstrate knowledge of **training and certification** requirements to use and maintain **MEWPs**	a. identify **training and certification** requirements to use and maintain **MEWPs**
A-2.05.04L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining **MEWPs**	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-2.06 Uses material handling equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.06.01P	select **material handling equipment** and **components**	**material handling equipment** and **components** are selected according to task and manufacturers' specifications
A-2.06.02P	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-2.06.03P	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-2.06.04P	position **material handling equipment**	**material handling equipment** is positioned according to task, manufacturers' specifications and site conditions
A-2.06.05P	use **material handling equipment**	**material handling equipment** is used according to manufacturers' specifications, site-specific requirements and jurisdictional regulations
A-2.06.06P	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-2.06.07P	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-2.06.01L	demonstrate knowledge of **material handling equipment**, their **components**, characteristics, applications and operation	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-2.06.02L	demonstrate knowledge of procedures to use and maintain **material handling equipment**	a. identify **hazards**, and describe safe work practices pertaining to using **material handling equipmen**t 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-2.06.03L	demonstrate knowledge of **training and certification** requirements to use and maintain **material handling equipment**	a. identify training and certification requirements to use and maintain **material handling equipment**
A-2.06.04L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining **material handling equipment**	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, pallet jacks, 0–8-ton industrial crane, gantry crane, spider 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-2.07 Uses ladders

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.07.01P	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-2.07.02P	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-2.07.03P	position **ladders**	**ladders** are positioned according to task, jurisdictional regulations, and company policies and procedures
A-2.07.04P	secure **ladders**	**ladders** are secured according to task, jurisdictional regulations, and company policies and procedures
A-2.07.05P	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-2.07.01L	demonstrate knowledge of **ladders**, their **components**, characteristics, applications and operation	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-2.07.02L	demonstrate knowledge of procedures to use and maintain **ladders** and their **components**	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-2.07.03L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining **ladders**	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-2.08 Uses scaffolding

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.08.01P	select and use scaffolding and **components**	scaffolding and **components** are selected and used according to task, and engineering and manufacturers' specifications
A-2.08.02P	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-2.08.03P	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-2.08.04P	secure scaffolding and **components**	scaffolding and **components** are secured according to scaffold design, engineering and manufacturers' specifications, and jurisdictional regulations
A-2.08.05P	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-2.08.01L	demonstrate knowledge of scaffolding, their **components**, characteristics, applications and operation	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-2.08.02L	demonstrate knowledge of procedures to use and maintain scaffolding and their **components**	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-2.08.03L	demonstrate knowledge of training and certification requirements to use and maintain scaffolding	a. identify training and certification requirements to use and maintain scaffolding
A-2.08.04L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining scaffolding	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-2.09 Uses surveying equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.09.01P	select and use **surveying equipment**	**surveying equipment** is selected and used according to task and manufacturers' specifications
A-2.09.02P	set up and check calibration on **surveying equipment**	**surveying equipment** is set up, checked and calibrated according to manufacturers' specifications to ensure accuracy
A-2.09.03P	calculate angles and distances	angles and distances are calculated according to drawings and task requirements
A-2.09.04P	lay out drawing information on site	drawing information is laid out on site
A-2.09.05P	verify plumbing and alignment of structure	plumbing and alignment of structure is verified according to drawings and required tolerances
A-2.09.06P	store and secure **surveying equipment**	**surveying equipment** is stored and secured according to manufacturers' specifications, and company policies and procedures
A-2.09.07P	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-2.09.01L	demonstrate knowledge of **surveying equipment**, their characteristics, applications and operation	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-2.09.02L	demonstrate knowledge of procedures to use **surveying equipment**	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-2.09.03L	demonstrate knowledge of training requirements to use **surveying equipment**	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-2.10 Uses welding equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.10.01P	select and use welding equipment, **components** and **consumables**	welding equipment, **components** and **consumables** are selected and used according to task and manufacturers' specifications
A-2.10.02P	set up welding equipment	welding equipment is set up according to task and manufacturers' specifications
A-2.10.03P	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-2.10.04P	perform **welding processes**	**welding processes** are performed according to codes, standards, task requirements and welding procedures
A-2.10.05P	adjust welding parameters	welding parameters are adjusted according to task requirements, manufacturers' specifications, codes and welding procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.10.06P	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-2.10.01L	demonstrate knowledge of welding equipment, their **components**, **consumables**, characteristics, applications and operation	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-2.10.02L	demonstrate knowledge of procedures to use and maintain welding equipment	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-2.10.03L	demonstrate knowledge of training and certification requirements to use and maintain welding equipment	a. identify training and certification requirements to use and maintain welding equipment
A-2.10.04L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining welding equipment	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-2.11 Uses mechanical cutting equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.11.01P	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-2.11.02P	set up **mechanical cutting equipment** and **components**	**mechanical cutting equipment** and **components** are set up according to task and manufacturers' specifications
A-2.11.03P	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

Reference Code	Performance Criteria	Evidence of Attainment
A-2.11.04P	adjust cutting parameters	cutting parameters are adjusted according to task requirements, manufacturers' specifications, and company policies and procedures
A-2.11.05P	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-2.11.06P	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-2.11.01L	demonstrate knowledge of **mechanical cutting equipment**, their **components**, characteristics, applications and operation	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-2.11.02L	demonstrate knowledge of procedures to use and maintain **mechanical cutting equipment** and their **components**	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-2.11.03L	demonstrate knowledge of training and certification requirements to use and maintain **mechanical cutting equipment**	a. identify training and certification requirements to use and maintain **mechanical cutting equipment**
A-2.11.04L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining **mechanical cutting equipment**	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-2.12 Uses thermal cutting equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.12.01P	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-2.12.02P	set up thermal cutting equipment and **components**	thermal cutting equipment and **components** are set up according to task and manufacturers' specifications
A-2.12.03P	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-2.12.04P	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-2.12.05P	adjust cutting and gouging parameters	cutting and gouging parameters are adjusted according to task requirements, welding procedures, and company policies and procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.12.06P	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
A-2.12.07P	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-2.12.01L	demonstrate knowledge of thermal cutting equipment, their **components**, **consumables**, characteristics, applications and operation	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-2.12.02L	demonstrate knowledge of procedures to use and maintain thermal cutting equipment	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-2.12.03L	demonstrate knowledge of regulatory requirements pertaining to using and maintaining thermal cutting equipment	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 (generalist) organize their work including materials and supplies. They perform layout and use drawings and documentation to plan and complete their work tasks. Ironworkers (generalist) 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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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
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

Reference Code	Performance Criteria	Evidence of Attainment
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	a. identify materials and supplies, and describe their characteristics, 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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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, reinforcing placing, post-tensioning placing, weld procedures, Building Information Modeling (BIM), placing prints
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, RFI, extra work order (EWO), change order/change directives
standards	CSA, CWB, ANSI, ASTM, Canadian Institute of Steel Construction (CISC), Reinforcing Steel Institute of Canada (RSIC)/Concrete Reinforcing Steel Institute (CRSI), Post-Tensioning Institute (PTI)
regulations	OHS, WHMIS, building codes

A-3.04 Plans tasks

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

Reference Code	Performance Criteria	Evidence of Attainment
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**
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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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, tradeshows, 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, tradeshows, 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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	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 (generalist) 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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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

Reference Code	Performance Criteria	Evidence of Attainment
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
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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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**

Reference Code	Performance Criteria	Evidence of Attainment
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
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	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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**	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**	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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)

signage	barricades, barrier tape, tags and signs
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 (generalist) 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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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-7.01.02L	demonstrate knowledge of procedures to inspect **rigging**, **hoisting and positioning equipment**	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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**	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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**, site plan, 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 task, site conditions, **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	a. identify tools and equipment used to secure load before rigging removal, and describe their procedures for use b. identify methods to determine load 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	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, turn buckles

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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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

Reference Code	Performance Criteria	Evidence of Attainment
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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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	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	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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**	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**	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 (generalist) 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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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

Reference Code	Performance Criteria	Evidence of Attainment
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	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

Reference Code	Learning Outcomes	Learning Objectives
B-9.01.02L	demonstrate knowledge of procedures to mobilize **telescopic boom cranes** and their **components**	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**
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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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
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

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	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**	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**	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
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	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**	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**	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**	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	slipsslips, tripstrips, 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 - Fabricates and installs reinforcing material

Task C-10 Fabricates reinforcing materials on-site

Task Descriptor

Ironworkers (generalist) fabricate reinforcing material on site. They cut and bend reinforcing materials such as various types of rebar, welded wire mesh fabric and post-tension materials.

C-10.01 Cuts reinforcing materials

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-10.01.01P	select and use tools and cutting equipment	tools and cutting equipment are selected and used according to task
C-10.01.02P	select **reinforcing materials**	**reinforcing materials** are selected according to engineering specifications
C-10.01.03P	calculate lengths of bars for **reinforcing materials**	lengths of bars for **reinforcing materials** are calculated according to bend dimensions and engineering specifications
C-10.01.04P	measure and mark **reinforcing materials** for cutting	**reinforcing materials** are measured and marked for cutting according to drawings, calculations and engineering specifications
C-10.01.05P	cut material	material is cut according to measurement and mark

Range of Variables (include, but not limited to)

reinforcing materials	rebar (e.g., composite, stainless steel, mild steel, galvanized, epoxy-coated), welded wire mesh fabric, post-tension material

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
C-10.01.01L	demonstrate knowledge of **reinforcing materials**, their characteristics and applications	a. identify **reinforcing materials**, and describe their characteristics and applications b. interpret information pertaining to **reinforcing materials** found on drawings and engineering specifications
C-10.01.02L	demonstrate knowledge of procedures to cut **reinforcing materials**	a. identify tools and equipment used to cut **reinforcing materials**, and describe their procedures for use b. identify **hazards**, and describe safe work practices and selection of PPE pertaining to cutting **reinforcing materials** c. describe procedures and calculations performed to measure and mark **reinforcing materials** d. describe techniques to cut **reinforcing materials** e. describe procedures to dispose of and recycle **reinforcing materials**
C-10.01.03L	demonstrate knowledge of regulatory requirements pertaining to cutting **reinforcing materials**	b. identify codes, standards and regulations pertaining to cutting **reinforcing materials**

Range of Variables (include, but not limited to)

reinforcing materials	rebar (e.g., composite, stainless steel, mild steel, galvanized, epoxy-coated), welded wire mesh fabric, post-tension material
hazards	burns, debris in eye, sparks, flying particles, pinching, crushing, fumes, sharp edges (cuts)

C-10.02 Bends reinforcing materials

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-10.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
C-10.02.02P	select **reinforcing materials**	**reinforcing materials** are selected according to engineering specifications
C-10.02.03P	select pin size	pin size is selected according to bend standards and CSA
C-10.02.04P	calculate bend dimension for **reinforcing materials**	bend dimensions for **reinforcing materials** are calculated according to bend sequence and engineering specifications
C-10.02.05P	measure and mark **reinforcing materials** for bending	**reinforcing materials** are measured and marked for bending according to engineering specifications calculations and
C-10.02.06P	bend **reinforcing materials**	**reinforcing materials** are bent according to engineering specifications, CSA and RSIC tolerances

Range of Variables (include, but not limited to)

reinforcing materials	stainless steel rebar, mild steel rebar, galvanized rebar, epoxy-coated rebar

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
C-10.02.01L	demonstrate knowledge of **reinforcing materials**, their characteristics and applications	a. identify **reinforcing materials**, and describe their characteristics and applications b. interpret information pertaining to **reinforcing materials** found on drawings and specifications
C-10.02.02L	demonstrate knowledge of procedures to bend **reinforcing materials**	a. identify tools and equipment used to bend **reinforcing materials**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to bending **reinforcing materials** **c.** describe procedures and calculations performed to measure and mark **reinforcing materials** d. describe techniques to bend **reinforcing materials** e. describe procedures to dispose of and recycle **reinforcing materials**

Range of Variables (include, but not limited to)

reinforcing materials	stainless steel rebar, mild steel rebar, galvanized rebar, epoxy-coated rebar
hazards	pinching, crushing, fumes, struck by material

Task C-11 Installs reinforcing materials

Task Descriptor

Ironworkers (generalist) install reinforcing materials for concrete structures such as buildings hydro dams, towers, bridges and specialty structures. They place, tie and splice reinforcing materials together to ensure structural integrity of the finished product.

C-11.01 Places reinforcing material

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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 and placing drawings
C-11.01.02P	select **reinforcing materials**	**reinforcing materials** are selected according to drawings and engineering specifications
C-11.01.03P	lay out **reinforcing materials**	**reinforcing materials** are laid out (measured and marked) for installation according to calculations, drawings, and engineering specifications
C-11.01.04P	select **falsework** for off-site pre-assembly	**falsework** for off-site pre-assembly is selected according to site conditions and engineering specifications
C-11.01.05P	apply manual and mechanical lifting and carrying techniques	manual and mechanical lifting and carrying techniques are applied to various reinforcing materials and components according to jurisdictional regulations, industry standards, and company policies and procedures

Reference Code	Performance Criteria	Evidence of Attainment
C-11.01.06P	support **reinforcing materials**	**reinforcing materials** are supported, and clearance and cover are maintained using **components** according to engineering specifications and RSIC tolerances
C-11.01.07P	place **reinforcing materials**	**reinforcing materials** are placed according to RSIC practices, and engineering specifications and placing drawings

Range of Variables (include, but not limited to)

reinforcing materials	rebar, welded wire mesh fabric, composite, prefabricated reinforcing units, tie wire
falsework	horses, dunnage, jigs
components	prefabricated items, chairs, bolsters, standees, mechanical couplers

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
C-11.01.01L	demonstrate knowledge of **reinforcing materials**, their **components**, characteristics and applications	a. identify types of **reinforcing materials**, and describe their characteristics and applications b. identify **reinforcing material components**, and describe their characteristics and applications c. interpret information pertaining to placing **reinforcing materials** and components found on drawings and specifications

Reference Code	Learning Outcomes	Learning Objectives
C-11.01.02L	demonstrate knowledge of procedures to place **reinforcing materials** and **components**	a. identify tools and equipment used to place **reinforcing materials** and **components**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to placing **reinforcing materials** and **components** c. describe installation sequence including laying out and placing ties and supports d. describe pre-assembly and pre-fabrication procedures e. describe procedures to place **reinforcing materials** and **components** f. describe procedures to dispose of and recycle **reinforcing materials** and **components**
C-11.01.03L	demonstrate knowledge of safety training and certification requirements to place **reinforcing materials** and **components**	a. identify safety training and certification requirements to place **reinforcing materials** and **components**
C-11.01.04L	demonstrate knowledge of regulatory requirements pertaining to placing **reinforcing materials** and **components**	a. identify codes, standards and regulations pertaining to placing **reinforcing materials** and **components**

Range of Variables (include, but not limited to)

reinforcing materials	rebar, welded wire mesh fabric, composite, prefabricated reinforcing units, tie wire
components	prefabricated items, chairs, bolsters, standees, mechanical couplers
hazards	pinching, crushing, struck by material, working at heights, open pits, overexertion

C-11.02 Ties reinforcing materials

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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	select wire type and gauge	wire type and gauge are selected according to application
C-11.02.03P	select and complete **ties**	**ties** are selected and completed according to application

Range of Variables (include, but not limited to)

ties	snap, figure-8, saddles, single or double wire, wrapped

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
C-11.02.01L	demonstrate knowledge of **ties**, their characteristics and applications	a. identify types of **ties**, and describe their characteristics and applications

Reference Code	Learning Outcomes	Learning Objectives
C-11.02.02L	demonstrate knowledge of procedures to tie **reinforcing materials**	a. identify tools and equipment used to tie **reinforcing materials**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to tying **reinforcing materials** c. describe sequence and procedures to tie **reinforcing materials** d. identify types of wire and gauges used to tie **reinforcing materials** e. describe procedures to inspect tied **reinforcing materials** f. describe procedures to dispose of and recycle **reinforcing materials**
C-11.02.03L	demonstrate knowledge of safety training and certification requirements to tie **reinforcing materials**	a. identify safety training and certification requirements to tie **reinforcing materials**
C-11.02.04L	demonstrate knowledge of regulatory requirements pertaining to tying **reinforcing materials**	a. identify codes, standards and regulations pertaining to tying **reinforcing materials**

Range of Variables (include, but not limited to)

ties	snap, figure-8, saddles, single or double wire, wrapped
reinforcing materials	rebar, welded wire mesh fabric, composite, prefabricated reinforcing units, tie wire
hazards	cuts, repetitive motions, punctures, pinching, crushing, struck by material, working at heights, open pits, overexertion

C-11.03 Splices reinforcing materials

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.03.01P	select and use tools, equipment and **components**	tools, equipment and **components** are selected and used according to task
C-11.03.02P	perform **splicing techniques**	**splicing techniques** are performed according to placing drawings, engineering specifications and RSIC tolerances

Range of Variables (include, but not limited to)

components	tire wire, mechanical couplers
splicing techniques	welding, lap splicing, mechanical splicing, coupling, non-contact splicing

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
C-11.03.01L	demonstrate knowledge of splices, their characteristics and applications	a. identify types of splices, and describe their characteristics and applications b. interpret information pertaining to splices found on drawings and specifications

Reference Code	Learning Outcomes	Learning Objectives
C-11.03.02L	demonstrate knowledge of procedures to splice **reinforcing materials**	a. identify tools, equipment and **components** used to splice **reinforcing materials**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to splicing **reinforcing materials** c. describe procedures to splice **reinforcing materials** d. describe **splicing techniques**, and their applications e. describe specialty splicing systems and their installation f. describe procedures to dispose of and recycle **reinforcing materials**
C-11.03.03L	demonstrate knowledge of safety training and certification requirements to splice **reinforcing materials**	a. identify safety training and certification requirements to splice **reinforcing materials**
C-11.03.04L	demonstrate knowledge of regulatory requirements pertaining to splicing **reinforcing materials**	a. identify codes, standards and regulations pertaining to splicing **reinforcing materials**

Range of Variables (include, but not limited to)

reinforcing materials	rebar, welded wire mesh fabric, composite, prefabricated reinforcing units
components	tire wire, mechanical couplers
hazards	burns, arc flashes, cuts, repetitive motions, punctures, pinching, crushing, struck by material, working at heights, open pits, overexertion
splicing techniques	welding, lap splicing, mechanical splicing, coupling, non-contact splicing

Major Work Activity D - Performs pre-stressing/post-tensioning

Task D-12 Places pre-stressed/post-tensioning systems

Task Descriptor

Ironworkers (generalist) place pre-stressed/post-tensioning systems in concrete structures that require larger spans and more shallow slabs. They lay out the profile and place tendons and accessories. They install bursting steel and anchorages. Ironworkers (generalist) connect tendons to anchorages and protect exposed tendons.

D-12.01 Lays out profile

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-12.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
D-12.01.02P	lay out (measure and mark) anchorages, tendon profiles and position	anchorages and tendon profiles and position are laid out (measured and marked) according to placing drawings

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-12.01.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on placing drawings
D-12.01.02L	demonstrate knowledge of procedures to lay out profile	a. identify tools and equipment used to lay out profile, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to laying out profile c. describe procedures to lay out profile d. identify placement tolerances of tendons, anchors and supports e. describe benchmarks and elevations f. describe procedures to inspect laid out profile
D-12.01.03L	demonstrate knowledge of industry training and certification requirements to lay out profile	a. identify industry training and certification requirements to lay out profile
D-12.01.04L	demonstrate knowledge of regulatory requirements pertaining to laying out profile	a. identify codes, standards and regulations pertaining to laying out profile

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets, grout
hazards	slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing

D-12.02 Places tendons and accessories

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-12.02.01P	select and use **tools and equipment**	**tools and equipment** are selected and used according to task, placing drawings and manufacturers' specifications
D-12.02.02P	position tendons and **accessories**	tendons and **accessories** are positioned according to engineering specifications found on placing drawings
D-12.02.03P	secure tendons and **accessories**	tendons and **accessories** are secured according to engineering specifications found on placing drawings and industry standards
D-12.02.04P	identify and repair damage to ducts and tendons	damaged ducts and tendons are identified and repaired according to engineering specifications found on placing drawings and industry standards

Range of Variables (include, but not limited to)

tools and equipment	winch, tugger, compressor, hydraulic pusher unit, dispensing pack, grout mixer
accessories	anchors, standees, chairs, bursting steel

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-12.02.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on placing drawings and engineering specifications
D-12.02.02L	demonstrate knowledge of tendons and **accessories**, their characteristics and applications	a. identify tendons and **accessories**, and describe their characteristics and applications b. interpret information pertaining to tendons and **accessories** found on placing drawings and engineering specifications

Reference Code	Learning Outcomes	Learning Objectives
D-12.02.03L	demonstrate knowledge of procedures to place tendons and **accessories**	a. identify **tools and equipment** used to place tendons and **accessories**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to placing tendons and **accessories** c. describe benchmarks and elevations d. describe procedures to position and secure tendons and **accessories** e. describe procedures to cut tendons f. describe procedures to install tendons and **accessories** g. describe pre-stressed/post-tensioning installation sequences h. describe procedures to inspect for damage to ducts and tendons i. identify placement tolerances of tendons, anchors and supports j. describe procedures to store tendons and **accessories** k. describe procedures to dispose of and recycle tendons and **accessories**
D-12.02.04L	demonstrate knowledge of industry training and certification requirements to place tendons and **accessories**	a. identify industry training and certification requirements to place tendons and **accessories**
D-12.02.05L	demonstrate knowledge of regulatory requirements pertaining to placing tendons and **accessories**	a. identify codes, standards and regulations pertaining to placing tendons and **accessories**

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets, grout
accessories	anchors, standees, chairs, bursting steel
tools and equipment	winch, tugger, compressor, hydraulic pusher unit, dispensing pack, grout mixer
hazards	slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing

D-12.03 Installs bursting steel and anchorages

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-12.03.01P	select and use tools, equipment and **components**	tools, equipment and **components** are selected and used according to task
D-12.03.02P	place, modify and tie bursting steel	bursting steel is placed, modified and tied according to engineering specifications found on placing drawings
D-12.03.03P	install anchorages	anchorages are installed according to engineering specifications found on placing drawings

Range of Variables (include, but not limited to)

components	blocks, wedges, anchors, spirals, hairpins, U bars, grillage

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-12.03.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on placing drawings and engineering specifications
D-12.03.02L	demonstrate knowledge of bursting steel and anchorages, their **components**, characteristics and applications	a. identify types of bursting steel and anchorages, and describe their characteristics and applications b. identify **components**, and describe their characteristics and applications c. interpret information pertaining to bursting steel and anchorages found on placing drawings and engineering specifications

Reference Code	Learning Outcomes	Learning Objectives
D-12.03.03L	demonstrate knowledge of procedures to install bursting steel and anchorages, and their **components**	a. identify tools and equipment used to install bursting steel, anchorages, and their **components**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to installing bursting steel, anchorages, and their **components** c. describe procedures to place, modify, and tie bursting steel d. describe procedures to install anchorages e. identify placing tolerances f. describe procedures to inspect installed bursting steel, anchorages, and their **components** g. describe procedures to dispose of and recycle bursting steel, anchorages, and their **components**
D-12.03.04L	demonstrate knowledge of industry training and certification requirements to install bursting steel and anchorages	a. identify industry training and certification requirements to install bursting steel and anchorages
D-12.03.05L	demonstrate knowledge of regulatory requirements pertaining to installing bursting steel and anchorages	a. identify codes, standards and regulations pertaining to installing bursting steel and anchorages

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets

components	blocks, wedges, anchors, spirals, hairpins, U bars, grillage
hazards	slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing

D-12.04 Connects tendons to anchorages

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-12.04.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-12.04.02P	connect to anchorages	anchorages are connected according to manufacturers’ specifications
D-12.04.03P	secure wedges	wedges are secured according to manufacturers’ specifications

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-12.04.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on manufacturers' specifications
D-12.04.02L	demonstrate knowledge of tendons and anchorages, their characteristics and applications	a. identify **types of tendons**, and describe their characteristics and applications b. identify **types of anchors**, and describe their characteristics and applications c. interpret information pertaining to tendons and anchorages found on manufacturers' specifications
D-12.04.03L	demonstrate knowledge of procedures to connect tendons to anchorages	a. identify tools and equipment used to connect tendons to anchorages, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to connecting tendons to anchorages c. describe procedures to connect tendons to anchorages d. describe fastening techniques e. describe procedures to inspect and verify connected tendons and anchorages f. describe procedures to dispose of and recycle tendons and anchorages

Reference Code	Learning Outcomes	Learning Objectives
D-12.04.04L	demonstrate knowledge of industry training and certification requirements to connect tendons to anchorages	a. identify industry training and certification requirements to connect tendons to anchorages
D-12.04.05L	demonstrate knowledge of regulatory requirements pertaining to connecting tendons to anchorages	a. identify codes, standards and regulations pertaining to connecting tendons to anchorages

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets
types of tendons	mono-strand, multi-strand, encapsulated
types of anchors	bearing plate, barrel (trumpet) anchor, mono-strand anchor, multi-strand anchor
hazards	slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing

D-12.05 Protects exposed tendons

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-12.05.01P	select and use tools and equipment	tools and equipment are selected and used according to task

Reference Code	Performance Criteria	Evidence of Attainment
D-12.05.02P	select **tendon protection materials**	**tendon protection materials** are selected according to engineering specifications and manufacturers' specifications
D-12.05.03P	identify and correct faults	faults are identified and corrected according to industry standards and engineering specifications and manufacturers' specifications
D-12.05.04P	install **tendon protection materials**	**tendon protection materials** are installed according to engineering specifications and manufacturers' specifications

Range of Variables (include, but not limited to)

tendon protection materials	marine grade tape, duct tape, heat shrink, grease/caulking, grout

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-12.05.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on manufacturers' specifications

Reference Code	Learning Outcomes	Learning Objectives
D-12.05.02L	demonstrate knowledge of tendons, **tendon protection materials**, their characteristics and applications	a. identify **types of tendons**, and describe their characteristics and applications b. identify types of **tendon protection materials**, and describe their characteristics and applications c. interpret information pertaining to tendons and **tendon protection materials** found on manufacturers' specifications
D-12.05.03L	demonstrate knowledge of procedures to protect tendons	a. identify tools and equipment used to protect tendons, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to protecting tendons c. describe procedures to protect tendons d. describe procedures to inspect protected tendons e. describe procedures to dispose of and recycle **tendon protection materials**
D-12.05.04L	demonstrate knowledge of industry training and certification requirements to protect tendons	a. identify industry training and certification requirements to protect tendons
D-12.05.05L	demonstrate knowledge of regulatory requirements pertaining to protecting tendons	a. identify codes, standards and regulations pertaining to protecting tendons

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets

types of tendons	mono-strand, multi-strand, encapsulated
tendon protection materials	marine grade tape, duct tape, heat shrink, grease/caulking, grout
hazards	burns, slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing

Task D-13 Stresses tendons

Task Descriptor

Ironworkers (generalist) stress tendons to implement a pre-stressed or post-stressed system. They set up and remove stressing equipment. Ironworkers (generalist) tension, cut and cap tendons. They de-stress tendons when required.

D-13.01 Sets up stressing equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-13.01.01P	select and use tools and stressing equipment	tools and stressing equipment are selected and used according to task
D-13.01.02P	position stressing equipment	stressing equipment is positioned according to site conditions
D-13.01.03P	connect **components**	**components** are connected according to manufacturers' specifications
D-13.01.04P	inspect stressing equipment	stressing equipment is inspected according to manufacturers' specifications

Range of Variables (include, but not limited to)

components	stressing jack, gauges, hoses, power supply, pump

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-13.01.01L	demonstrate knowledge of stressing equipment, their **components** characteristics, applications and operation	a. identify types of stressing equipment, and describe their characteristics and applications b. identify **components**, and describe their characteristics and applications c. describe limitations and operating principles of stressing equipment d. interpret information pertaining to stressing equipment found on manufacturers' specifications
D-13.01.02L	demonstrate knowledge of procedures to set up stressing equipment	a. identify tools and equipment used to set up stressing equipment, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to setting up stressing equipment c. describe procedures and sequence to set up stressing equipment d. identify power supplies e. describe procedures to inspect stressing equipment f. describe procedures to test set up stressing equipment g. describe procedures to dispose of and recycle stressing equipment **components**
D-13.01.03L	demonstrate knowledge of industry training requirements to set up stressing equipment	a. identify industry training requirements to set up stressing equipment
D-13.01.04L	demonstrate knowledge of regulatory requirements pertaining to setting up stressing equipment	a. identify codes, standards and regulations pertaining to setting up stressing equipment

Range of Variables (include, but not limited to)

components	stressing jack, gauges, hoses, power supply, pump
hazards	burns, injection, slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, potential energy (stored), hydraulic fluid under pressure, electrocution

D-13.02 Tensions tendons

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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 manufacturers' specifications, task, and engineering specifications found on placing drawings
D-13.02.02P	connect stressing equipment to tendons	stressing equipment is connected to tendons according to placing drawings and manufacturers' specifications
D-13.02.03P	operate stressing equipment	stressing equipment is operated according to engineering and manufacturers' specifications
D-13.02.04P	troubleshoot hung up jack	troubleshooting is performed to remove hung up jack manufacturers' specifications and industry standards
D-13.02.05P	document elongation and gauge readings	elongation and gauge readings are documented according to engineering specifications, and client and industry requirements

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-13.02.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on placing drawings
D-13.02.02L	demonstrate knowledge of tendons, their **components**, characteristics and applications	a. identify types of tendons, and describe their characteristics and applications b. identify **components**, and describe their characteristics and applications c. describe limitations and operating principles of stressing equipment d. interpret information pertaining to tensioning tendons and their **components** found on placing drawings

Reference Code	Learning Outcomes	Learning Objectives
D-13.02.03L	demonstrate knowledge of procedures to stress tendons and their **components**	a. identify tools and equipment used to stress tendons and their **components**, and describe their specifications and procedures for use b. identify **hazards**, and describe safe work practices pertaining to stressing tendons and their **components** c. identify potential deficiencies of tendons and their **components** d. describe procedures to stress tendons and their **components** e. identify gauge pressures and elongation, and their related tolerances f. describe tendon and anchoring locking methods g. describe procedures to inspect stressed tendons and their **components** h. describe procedures to test stressed tendons and their **components** i. describe procedures to dispose of and recycle materials when stressing tendons
D-13.02.04L	demonstrate knowledge of industry training and certification requirements to tension tendons and their **components**	a. identify industry training and certification requirements to tension tendons and their **components**
D-13.02.05L	demonstrate knowledge of regulatory requirements pertaining to tensioning tendons and their **components**	a. identify codes, standards and regulations pertaining to tensioning tendons and their **components**

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets
components	wedges, wedge plate, strands, jack, troubleshooting anchor
hazards	burns, injection, slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, potential energy (stored), hydraulic fluids under pressure, electrocution, impalement, dismemberment

D-13.03 Cuts and caps tendons

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-13.03.01P	select and use tools and cutting equipment	tools and cutting equipment are selected and used according to engineering specifications found on placing drawings, manufacturers' specifications and task
D-13.03.02P	cut tendons	tendons are cut according to site conditions and engineering specifications found on placing drawings
D-13.03.03P	secure caps to anchors	anchors are secured to caps according to engineering specifications found on placing drawings and manufacturers’ specifications

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-13.03.01L	demonstrate knowledge of caps, their characteristics and applications	a. identify types of caps, and describe their characteristics and applications b. interpret information pertaining to caps found on placing drawings and manufacturers' specifications
D-13.03.02L	demonstrate knowledge of procedures to cut and cap tendons	a. identify tools and equipment used to cut and cap tendons, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to cutting and capping tendons c. describe procedures to cut tendons d. describe procedures to cap tendons e. describe procedures to inspect cut and capped tendons f. describe procedures to dispose of and recycle caps and tendons
D-13.03.03L	demonstrate knowledge of regulatory requirements pertaining to cutting and capping tendons	a. identify codes, standards and regulations pertaining to cutting and capping tendons

Range of Variables (include, but not limited to)

hazards	slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, potential energy (stored), electrocution, burns

D-13.04 Removes stressing equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-13.04.01P	select and use tools, equipment and **components**	tools, equipment and **components** are selected and used according to task
D-13.04.02P	clean and maintain stressing equipment and **components**	stressing equipment and **components** are cleaned and maintained according to manufacturers' specifications, and company policies and procedures
D-13.04.03P	demobilize and store stressing equipment	stressing equipment is demobilized and stored according to manufacturers' specifications, and company policies and procedures

Range of Variables (include, but not limited to)

components	stressing jacks, gauges, hoses, power supply, pump

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-13.04.01L	demonstrate knowledge of stressing equipment, their **components**, characteristics, applications and operation	a. identify types of stressing equipment, and describe their characteristics and applications b. identify **components**, and describe their characteristics and applications c. describe limitations and operating principles of stressing equipment and their **components** d. interpret information pertaining to stressing equipment and their **components** found on placing drawings and manufacturers' specifications
D-13.04.02L	demonstrate knowledge of procedures to remove stressing equipment and their **components**	a. identify tools and equipment used to remove stressing equipment and their **components**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to removing stressing equipment and their **components** c. describe procedures to clean and maintain stressing equipment, and their **components** d. describe procedures to demobilize and store stressing equipment, and their **components**
D-13.04.03L	demonstrate knowledge of industry training and certification requirements to remove stressing equipment	a. identify industry training and certification requirements to remove stressing equipment
D-13.04.04L	demonstrate knowledge of regulatory requirements pertaining to removing stressing equipment	a. identify codes, standards and regulations pertaining to removing stressing equipment

Range of Variables (include, but not limited to)

components	stressing jacks, gauges, hoses, power supply, pump
hazards	slips, trips, falls, struck by material, sharp edges (cuts), overexertion, abrasions, pinching, crushing, potential energy (stored), hydraulic fluid under pressure, electrocution, punctures

D-13.05 De-stresses tendons

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	yes	ND	yes	yes	ND	ND	no	ND	ND	ND

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-13.05.01P	identify and control potential **hazards**	potential **hazards** are identified and controlled according to site conditions, jurisdictional regulations, company policies and procedures, manufacturers' specifications, codes, and task
D-13.05.02P	select and use tools, equipment and **components**	tools, equipment and **components** are selected and used according to task
D-13.05.03P	connect stressing equipment and **components** to tendons	stressing equipment and **components** are connected to tendons according to placing drawings, jurisdictional regulations and manufacturers' specifications
D-13.05.04P	operate stressing equipment and **components**	stressing equipment and **components** are operated according to placing drawings, jurisdictional regulations and manufacturers' specifications
D-13.05.05P	document destressing results	destressing results are documented according to engineering specifications, and company policies and procedures

Range of Variables (include, but not limited to)

hazards	equipment failure, material failure, danger zones, hydraulic fluid under pressure, punctures
components	wedges, wedge plate, strands, jacks, de-tensioning tool, jack feet

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-13.05.01L	demonstrate knowledge of **pre-stressed/post-tensioning systems**, their **materials**, characteristics, applications and operation	a. identify **pre-stressed/post-tensioning systems**, and describe their characteristics, applications and operation b. identify **pre-stressed/post-tensioning materials**, and describe their characteristics and applications c. interpret information pertaining to **pre-stressed/post-tensioning systems** and **pre-stressed/post-tensioning materials** found on drawings and engineering specifications
D-13.05.02L	demonstrate knowledge of tendons, their **components**, characteristics and applications	a. identify types of tendons, and describe their characteristics and applications b. identify **components**, and describe their characteristics and applications c. describe limitations and operating principles of stressing equipment d. interpret information pertaining to tensioning tendons and their **components** found on placing drawings and manufacturers' specifications

Reference Code	Learning Outcomes	Learning Objectives
D-13.05.03L	demonstrate knowledge of procedures to de-stress tendons and their **components**	a. identify tools and equipment used to de-stress tendons and their **components**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to de-stressing tendons and their **components** c. identify potential deficiencies of tendons and their **components** d. identify gauge pressures e. describe tendon locking methods f. describe procedures to de-stress tendons and their **components** g. describe procedures to dispose of and recycle materials when de-stressing tendons and their **components**
D-13.05.04L	demonstrate knowledge of industry training and certification requirements to de-stress tendons and their **components**	a. identify industry training and certification requirements to de-stress tendons and their **components**
D-13.05.05L	demonstrate knowledge of regulatory requirements pertaining to de-stressing tendons and their **components**	a. identify codes, standards and regulations pertaining to de-stressing tendons and their **components**

Range of Variables (include, but not limited to)

pre-stressed/post-tensioning systems	bonded, un-bonded, mono-strand, multi-strand, thread bar
pre-stressed/post-tensioning materials	duct, strand, bar, anchor assembly, funnels, connectors, inlets, outlets
components	wedges, wedge plate, strands, jacks, de-tensioning tool, jack feet
hazards	equipment failure, material failure, danger zones, hydraulic fluid under pressure, punctures

Task D-14 Grouts tendons

Task Descriptor

Ironworkers (generalist) install grout in bonded post-tensioning systems. They set-up, use and maintain grouting equipment. Ironworkers (generalist) install grout into tendon ducts to provide a mechanical bond as well as corrosion protection to finalize the post-tensioning system installation.

D-14.01 Sets up grouting equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.01.01P	select and use tools, grouting equipment and **components**	tools, grouting equipment and **components** are selected and used according to task and manufacturers' specifications
D-14.01.02P	set up grouting equipment and **components**	grouting equipment and **components** are set up according to manufacturers’ specifications and placing drawings

Reference Code	Performance Criteria	Evidence of Attainment
D-14.01.03P	test systems and grouting equipment	systems and grouting equipment are tested according to engineering and manufacturers' specifications
D-14.01.04P	identify and rectify obstructions in ducts and hoses	obstructions in ducts and hoses are identified and rectified according to industry standards and jurisdictional regulations
D-14.01.05P	organize grouting material	grouting material is organized according to placing drawings and manufacturers' specifications
D-14.01.06P	clean and maintain grouting equipment	grouting equipment is cleaned and maintained according to manufacturers' specifications, and company policies and procedures

Range of Variables (include, but not limited to)

components	mixer, pump, air vent, grout lines, air compressor, anchors

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-14.01.01L	demonstrate knowledge of grouting equipment, their **components**, characteristics, applications and operation	a. identify types of grouting equipment, and describe their characteristics and applications b. identify **components**, and describe their characteristics and applications c. describe operating principles of grouting equipment and their **components** d. interpret information pertaining to grouting equipment found on placing drawings and manufacturers' specifications

Reference Code	Learning Outcomes	Learning Objectives
D-14.01.02L	demonstrate knowledge of procedures to set up grouting equipment and their **components**	a. identify tools and equipment used to set up grouting equipment and their **components**, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to setting up grouting equipment and their **components** c. describe procedures to set up grouting equipment and their **components** d. describe procedures to inspect set up of grouting equipment and their **components** e. describe procedures to test systems and grouting equipment f. describe procedures to dispose of grout
D-14.01.03L	demonstrate knowledge of industry training and certification requirements to set up grouting equipment	a. identify industry training and certification requirements to set up grouting equipment
D-14.01.04L	demonstrate knowledge of regulatory requirements pertaining to set up grouting equipment	a. identify codes, standards and regulations pertaining to set up grouting equipment

Range of Variables (include, but not limited to)

components	mixer, pump, air vent, grout lines, air compressor, anchors
hazards	moving equipment parts, compressed air, chemical burns, working at heights, electrocution, punctures, trips, cuts

D-14.02 Installs grout

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	NV	yes	ND	yes	yes	ND	ND	yes	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 and manufacturers' specifications
D-14.02.02P	operate grouting equipment	grouting equipment is operated according to manufacturers' specifications
D-14.02.03P	mix grout	grout is mixed according to engineering and manufacturers' specifications
D-14.02.04P	test grout	grout is tested according to engineering and manufacturers' specifications
D-14.02.05P	install grout	grout is installed according to engineering and manufacturers' specifications
D-14.02.06P	troubleshoot grouting systems	troubleshooting of grouting systems is performed according to industry practices, and engineering and manufacturers' specifications
D-14.02.07P	clean and maintain grouting equipment	grouting equipment is cleaned and maintained according to manufacturers' specifications, and company policies and procedures

Knowledge

Reference Code	Learning Outcomes	Learning Objectives
D-14.02.01L	demonstrate knowledge of grout, their characteristics and applications	a. identify types of grout, and describe their characteristics and applications b. interpret information pertaining to grout found on drawings and specifications
D-14.02.02L	demonstrate knowledge of procedures to install grout	a. identify grouting tools and equipment, and describe their procedures for use b. identify **hazards**, and describe safe work practices pertaining to installing grout c. describe procedures to measure quantities and ratios d. describe procedures and sequencing of mixing e. describe procedures to install grout f. describe procedures to inspect installed grout g. describe procedures to test installed grout h. describe procedures to clean and maintain grouting tools and equipment i. describe procedures to dispose of grout
D-14.02.03L	demonstrate knowledge of industry training and certification requirements to install grout	a. identify industry training and certification requirements to install grout
D-14.02.04L	demonstrate knowledge of environmental and regulatory requirements pertaining to installing grout	a. identify codes, standards and regulations pertaining to installing grout

Range of Variables (include, but not limited to)

hazards	moving equipment parts, compressed air, chemical burns, working at heights, silica

Major Work Activity E - Performs erection, assembly and installation

Task E-15 Installs primary and secondary structural members

Task Descriptor

Ironworkers (generalist) 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.

E-15.01 Uses falsework

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-15.01.01P	determine need for falsework	need for falsework is determined according to engineering specifications, task and industry standards
E-15.01.02P	select and use tools and equipment	tools and equipment are selected and used according to task
E-15.01.03P	determine location of falsework	location of falsework is determined according to engineering specifications, task and industry standards
E-15.01.04P	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
E-15.01.05P	place and secure falsework	falsework is placed and secured according to engineering specifications, task and industry standards
E-15.01.06P	inspect falsework	falsework is inspected according to industry standards and engineering specifications
E-15.01.07P	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
E-15.01.01L	demonstrate knowledge of falsework, their **components**, characteristics and applications	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
E-15.01.02L	demonstrate knowledge of procedures to erect falsework	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
E-15.01.03L	demonstrate knowledge of procedures to remove falsework	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
E-15.01.04L	demonstrate knowledge of regulatory requirements pertaining to falsework	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

E-15.02 Attaches structural members

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-15.02.01P	select and use **tools, equipment** and **components**	**tools, equipment** and **components** are selected and used according to task
E-15.02.02P	**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
E-15.02.03P	fit, place and modify **structural members**	**structural members** are fit, placed and modified according to drawings, engineering specifications and industry standards
E-15.02.04P	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
E-15.02.01L	demonstrate knowledge of **structural members**, their **components**, **materials**, characteristics and applications	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
E-15.02.02L	demonstrate knowledge of procedures to attach **structural members**	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**
E-15.02.03L	demonstrate knowledge of regulatory requirements pertaining to attaching **structural members**	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

E-15.03 Levels, plumbs and aligns structural members

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-15.03.01P	select and use **tools, equipment**, **components** and **fasteners**	**tools, equipment**, **components** and **fasteners** are selected and used according to task and manufacturers' specifications
E-15.03.02P	attach **temporary bracing**	**temporary bracing** is attached according to engineering specifications, industry standards and drawings
E-15.03.03P	verify and adjust alignment	alignment is verified and adjusted according to gridlines
E-15.03.04P	verify and adjust plumb	plumb is verified and adjusted according to surveying equipment information
E-15.03.05P	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
E-15.03.01L	demonstrate knowledge of **structural members**, their **components**, **materials**, characteristics and applications	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
E-15.03.02L	demonstrate knowledge of procedures to level, align and plumb **structural members**	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
E-15.03.03L	demonstrate knowledge of training requirements to level, align and plumb **structural members**	a. identify training requirements to level, align and plumb **structural members**
E-15.03.04L	demonstrate knowledge of regulatory requirements pertaining to levelling, aligning and plumbing **structural members**	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

E-15.04 Completes installation of structural members

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-15.04.01P	select and use **tools, equipment** and **components**	**tools, equipment** and **components** are selected and used according to task
E-15.04.02P	select type, grade and length of **fasteners**	**fastener** type, grade and length are selected according to drawings and industry standards
E-15.04.03P	align and fasten **structural members**	**structural members** are aligned and fastened according to drawings and industry standards
E-15.04.04P	perform pre-installation verification test	pre-verification test for pre-tensioning methods is completed using hydraulic load cell
E-15.04.05P	pre-tension bolts	bolts are tensioned using **tensioning methods** according to codes, engineering and manufacturers' specifications, and industry standards
E-15.04.06P	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
E-15.04.01L	demonstrate knowledge of **structural members**, their **components**, characteristics and applications	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** and their **components** found on drawings and specifications

Reference Code	Learning Outcomes	Learning Objectives
E-15.04.02L	demonstrate knowledge of procedures to complete installation of **structural members**	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**
E-15.04.03L	demonstrate knowledge of training and certification requirements to complete installation of **structural members**	a. identify training and certification requirements to complete installation of **structural members**
E-15.04.04L	demonstrate knowledge of regulatory requirements pertaining to complete installation of **structural members**	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 E-16 Installs ornamental, miscellaneous and steel cladding systems and components

Task Descriptor

Ironworkers (generalist) 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.

E-16.01 Installs curtain walls, precast walls and window walls

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-16.01.01P	select and use **tools and equipment**	**tools and equipment** are selected and used according to task
E-16.01.02P	establish benchmarks and control lines	benchmarks and control lines are established according to surveying information, drawings and industry standards
E-16.01.03P	lay out anchors for curtain wall and window wall	anchors are laid out according to drawings and industry standards
E-16.01.04P	install **curtain walls**	**curtain walls** are installed according to codes, drawings, manufacturers' specifications and industry standards

Reference Code	Performance Criteria	Evidence of Attainment
E-16.01.05P	install **window wall components**	**window wall components** are installed according to drawings, manufacturers' specifications and industry standards
E-16.01.06P	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
E-16.01.01L	demonstrate knowledge of **curtain walls** and window walls, their **components**, characteristics, applications and operation	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
E-16.01.02L	demonstrate knowledge of procedures to install **curtain walls** and window walls	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
E-16.01.03L	demonstrate knowledge of regulatory requirements pertaining to installing **curtain walls** and window walls	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

E-16.02 Installs miscellaneous components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-16.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
E-16.02.02P	fasten and attach **miscellaneous components**	**miscellaneous components** are fastened and attached using **fasteners**
E-16.02.03P	field-fabricate and modify **miscellaneous components**	**miscellaneous components** are field-fabricated and modified according to codes, task, drawings, and industry standards
E-16.02.04P	completes installation	installation is completed by cutting, grinding, welding and fitting components according to codes, task, drawings and industry standards
E-16.02.05P	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
E-16.02.01L	demonstrate knowledge of **miscellaneous components**, characteristics, applications and operation	a. identify **miscellaneous components**, and describe their characteristics and applications b. interpret information pertaining to **miscellaneous components** found on drawings and specifications
E-16.02.02L	demonstrate knowledge of procedures to install **miscellaneous components**	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**
E-16.02.03L	demonstrate knowledge of regulatory requirements pertaining to installing **miscellaneous components**	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

E-16.03 Installs steel cladding and building envelope systems and components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-16.03.01P	select and use tools and equipment	tools and equipment are selected and used according to task
E-16.03.02P	establish benchmarks and control lines	benchmarks and control lines are established according to surveying information, drawings and industry standards
E-16.03.03P	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
E-16.03.04P	install **steel cladding and roofing**	**steel cladding and roofing** are installed according to codes, drawings, manufacturers' specifications, industry standards, and company policies and procedures
E-16.03.05P	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
E-16.03.06P	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
E-16.03.01L	demonstrate knowledge of steel cladding, and building envelope systems and **components**, their characteristics, applications and operation	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
E-16.03.02L	demonstrate knowledge of emerging building technologies and practices pertaining to steel cladding, and building envelope systems and **components**	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 describe their characteristics and applications

Reference Code	Learning Outcomes	Learning Objectives
E-16.03.03L	demonstrate knowledge of procedures to install steel cladding, and building envelope systems and **components**	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**
E-16.03.04L	demonstrate knowledge of training and certification requirements to install of steel cladding, and building envelope systems and **components**	a. identify training and certification requirements to install of steel cladding, and building envelope systems and **components**
E-16.03.05L	demonstrate knowledge of regulatory requirements pertaining to installing of steel cladding, and building envelope systems and **components**	a. identify codes, standards and regulations pertaining to installing of 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 E-17 Installs conveyors, machinery and equipment

Task Descriptor

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

E-17.01 Installs material handling systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-17.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
E-17.01.02P	establish work points with surveying equipment	work points are established with surveying equipment according to drawings and industry standards
E-17.01.03P	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
E-17.01.04P	assemble material handling system components	material handling system components are assembled according to drawings, manufacturers' specifications and industry standards
E-17.01.05P	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
E-17.01.01L	demonstrate knowledge of **material handling systems**, their components, characteristics, applications and operation	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
E-17.01.02L	demonstrate knowledge of procedures to install **material handling systems**	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, high pressure hydraulic fluid, loud noises, awkward positioning, burns, repetitive motions, flying metal shavings, fires, congested work areas, sharp edges

E-17.02 Performs alignment and commissioning of material handling systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-17.02.01P	select and use **tools and equipment**	**tools and equipment** are selected and used according to task
E-17.02.02P	establish benchmarks and control lines	benchmarks and control lines are established according to surveying information, drawings and industry standards
E-17.02.03P	verify tolerances	tolerances are verified according to drawings
E-17.02.04P	use **precision tools and measuring instruments**	**precision tools and measuring instruments** are used according to task and manufacturers' specifications
E-17.02.05P	rig and jack components	components are rigged and jacked according to task and manufacturers’ specifications
E-17.02.06P	secure components	components are secured according to drawings and manufacturers’ specifications
E-17.02.07P	test **material handling system**	**material handling system** is tested according to design and manufacturers’ specifications
E-17.02.08P	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
E-17.02.01L	demonstrate knowledge of **material handling systems**, their components, characteristics, applications and operation	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
E-17.02.02L	demonstrate knowledge of procedures to align **material handling systems**	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 F - Performs maintenance and upgrading

Task F-18 Decommissions, disassembles and removes structural, ornamental mechanical and miscellaneous components

Task Descriptor

Before disassembly and removal tasks can begin, ironworkers (generalist) 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 (generalist) disassemble and remove structural, mechanical and miscellaneous components.

F-18.01 Ensures decommissioning of structure and components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
F-18.01.01P	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
F-18.01.02P	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
F-18.01.01L	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
F-18.01.02L	demonstrate knowledge of training and certification requirements to perform lockout and tagout	a. identify training and certification requirements to perform lockout and tagout
F-18.01.03L	demonstrate knowledge of regulatory requirements pertaining to lockout and tagout	a. identify codes, standards and regulations pertaining to lockout and tagout

F-18.02 Disassembles structural, ornamental, mechanical and miscellaneous components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
F-18.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
F-18.02.02P	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
F-18.02.03P	plan sequence of disassembly	sequence of disassembly is planned according to industry standards and engineering specifications

Reference Code	Performance Criteria	Evidence of Attainment
F-18.02.04P	assess need for rigging	need for rigging is assessed according to task and industry standards
F-18.02.05P	assess need for falsework	need for falsework is assessed according to task, industry standards, and engineering specifications
F-18.02.06P	remove **structural**, ornamental, mechanical and **miscellaneous** components	components are removed using various **methods** according to task, drawings and industry standards
F-18.02.07P	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
F-18.02.01L	demonstrate knowledge of procedures to remove **structural**, ornamental, mechanical and **miscellaneous components**	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 F-19 Maintains and repairs components

Task Descriptor

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

F-19.01 Assesses current condition of components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
F-19.01.01P	select and use **diagnostic tools**	**diagnostic tools** are selected and used according to task
F-19.01.02P	confirm components meet specifications	confirm components meet specifications using various **methods** according to manufacturers' specifications, and company policies and procedures
F-19.01.03P	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
F-19.01.01L	demonstrate knowledge of procedures to assess components	a. identify **diagnostic tools** and equipment used to assess components, and describe their procedures for use b. describe **methods** to assess components c. 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

F-19.02 Performs repairs, revisions and reinforcing of components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
F-19.02.01P	select and use **tools and equipment**	**tools and equipment** are selected and used according to task
F-19.02.02P	lay out components for field-fabrication and repair	components are laid out for field-fabrication and repair according to task, drawings and codes

Reference Code	Performance Criteria	Evidence of Attainment
F-19.02.03P	field-fabricate components	components are field-fabricated using various **methods** according to task, drawings and industry standards
F-19.02.04P	assemble components	components are assembled using various **methods** according to task, drawings, industry standards and manufacturers' specifications
F-19.02.05P	perform **repair, revision and reinforcing procedures**	**repair, revision and reinforcing procedures** are performed according to task, drawings, industry standards and manufacturers' specifications
F-19.02.06P	**finish** components	components are **finished** according to task, drawings, industry standards and manufacturers' specifications
F-19.02.07P	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
F-19.02.01L	demonstrate knowledge of procedures for repair, revision and reinforcing	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)

F-19.03 Replaces components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
F-19.03.01P	select and use tools and equipment	tools and equipment are selected and used according to task
F-19.03.02P	install temporary and permanent supports	temporary and permanent supports are installed according to task, drawings, industry standards and manufacturers' specifications
F-19.03.03P	remove **defective** components	**defective** components are removed according to task, drawings, industry standards, manufacturers' specifications, client directive, and company policies and procedures
F-19.03.04P	install replacement components	replacement components are installed using **methods** according to task, drawings, industry standards and manufacturers' specifications
F-19.03.05P	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
F-19.03.01L	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)

F-19.04 Performs preventative maintenance

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
F-19.04.01P	select and use tools and equipment	tools and equipment are selected and used according to task
F-19.04.02P	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
F-19.04.03P	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
F-19.04.01L	demonstrate knowledge of mechanical components that require preventative maintenance, characteristics, applications and operation	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
F-19.04.02L	demonstrate knowledge of procedures to perform preventative maintenance	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, toxic fumes, 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
CNZEAA	Canadian Net-Zero Emissions Accountability Act
CRSI	Concrete Reinforcing Steel Institute
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
RSIC	Reinforcing Steel Institute of Canada
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

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)	ancrage 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
insulated gloves	gants isolants
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
rubber gloves	gants de caoutchouc
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 vapeut
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 (sleever 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	pinces de pont
button punch (crimper)	pinces à crever (pinces à sertir)
cable cutters	pinces 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
hickey bar	barre de cintrage
hoses (hydraulic, grout, pneumatic, water)	tuyaux (coulis, pneumatique, eau)
keel	quille
knives	couteaux
marlinspike	poinçon à épisser

measuring tape	ruban à mesurer
needle nose pliers	pinces 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
tie wire reel	rouleau de fil de ligature
tin snips	cisailles de ferblantier
tool belt	ceinture à outils
tool bucket	seau à outils
utility knives	couteaux utilitaires
welding pick	pic à souder
wire brush	brosse métallique
wire reel	dévidoir à fil 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	cintreuses
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 électriques
gas cut-off saw	scie à tronçonner à essence
generator	génératrice
grinder	meuleuse
grouting machine	machine à coulis
hammer drill	marteau perforateur
hydraulic jacks (and accessories)	vérins hydrauliques (et accessoires)
impact drill	perceuse électrique
impact gun	pistolet cloueur
magnetic drill	perceuse magnétique
peening tool	outil de martelage
percussion drill	perceuse à percussion
pneumatic gun	pistolet pneumatique
portable band saw	scie portative
powder-actuated tool	fixateur à cartouches
power bender	cintreuse électrique
power cords	cordons d’alimentation
power drill	perceuse électrique
power shears	cisailles mécaniques
power wrench	perceuse magnétique
reciprocating saw	scie alternative
rivet buster	coupe-rivet
riveting gun	pistolet à riveter
rotary tools	outils rotatifs
tension control gun	pistolet à serrage dynamométrique
torquing and tensioning tools	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
densometers (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	boitiers 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)
barges	barges
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 (toutes catégories) y compris haute capacité
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	pinces 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	poulies
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

Pre-stressing/Post-tensioning Equipment / Équipement de précontrainte et de posttension

cable feeder	dérouleur de câble
carousel	carrousel
caulking gun	pistolet de calfeutrage
centre-hole jack	vérin à piston creux
de-tensioning stool	réducteur de tension
duct tape	ruban adhésif en toile
gauges	jauges
grippers	pinces
grout machine	machine à coulis

heat shrink	gaines thermorétractables
hex wrenches	clés hexagonales
hydraulic pumps	pompes hydrauliques
knife	couteaux
mono-strand stressing jack	vérin à brin simple ou à câble simple
multi-strand stressing jack	vérin à brin multiple
pocket shear	cisaille guide
seating tools	outils d’assises
sheath cutting tool	outil pour couper une gaine de câble
staple gun	pistolets agrafeurs
troubleshooting anchor	ancrage de dépannage

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, fabrication, reinforcing placing, post-tensioning placing, 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, fabrication, mise en place de renforcement, mise en posttension, 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 gréée 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
placing accessories	items used in conjunction with reinforcing steel such as bar chairs, slab bolsters, post tensioning specific (bullets and fingerforks, pocket formers), etc.	**accessoires de mise en place**	objets utilisés avec les armatures d'acier comme les chaises à béton, les patins de support, les éléments spécifiques de post-tension (balles et fourchettes, formeurs de poches), etc.
positioning	moving rigged loads into position (other than vertical, which is considered hoisting)	**positionnement**	déplacer des charges gréées 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 de charpente 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 de charpente 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