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Red Seal Occupational Standard

Sprinkler Fitter

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Sprinkler Fitter

Title: Sprinkler Fitter

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Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the national standard for the Sprinkler Fitter 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
Skilled Trades and Workforce Mobility Directorate
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Gatineau, Quebec K1A 0J9

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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.

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This standard was prepared by the Skilled Trades and Workforce Mobility 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 Ontario, the host jurisdiction 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 Sprinkler Fitter Trade: an overview of the trade's duties, work environment, job requirements, similar occupations and career progression

Trends in the Sprinkler Fitter Trade: some of the trends identified by industry as being the most important for workers in this trade

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

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

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

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

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

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

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

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

- **Task**: distinct actions that describe the activities within a major work activity
- **Task Descriptor**: a general description of the task
- **Sub-task**: distinct actions that describe the activities within a task
- **Skills**:
    - **Performance Criteria**: description of the activities that are done as the sub-task is performed
    - **Evidence of Attainment**: proof that the activities of the sub-task meet the expected performance of a tradesperson who has reached journey person level
    - **Range of Variables**: elements and examples (not all-inclusive) that provide a more in-depth description of a term used in the performance criteria and evidence of attainment
- **Knowledge**:
    - **Learning Outcomes**: describes what should be learned relating to a sub-task while participating in technical or in-school training
    - **Learning Objectives**: topics to be covered during technical or in-school training in order to meet the learning outcomes for the sub-task
    - **Range of Variables**: elements and examples (not all-inclusive) that provide a more in-depth description of a term used in the learning outcomes and learning objectives

- **Appendix A—Acronyms**: a list of acronyms used in the standard with their full name
- **Appendix B—Tools and Equipment / Outils et Équipement**: a bilingual non-exhaustive list of tools and equipment used in this trade
- **Appendix C—Glossary / Glossaire**: bilingual definitions or explanations of selected technical terms used in the standard

Methodology

Development of the Standard

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

Harmonization of Apprenticeship Training

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

Online Survey

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

Draft Review

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

Validation and Weighting

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

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

The results of this exercise are submitted to the RSOS development team who then analyzes the data and incorporates it into the document. The RSOS provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for MWA and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

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

Definitions for Validation and Weighting

yes	sub-task performed by qualified workers in the occupation in that province or territory
no	sub-task not performed by qualified workers in the occupation in that province or territory
NV	standard 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 Sprinkler Fitter Trade

“Sprinkler Fitter” is this trade’s official Red Seal occupational title approved by the CCDA. This standard covers tasks performed by sprinkler fitters.

Sprinkler fitters lay out, install, commission, modify, inspect, test, maintain, troubleshoot and repair fire protection and suppression systems in a variety of buildings and settings. They work on fire protection and suppression systems including, but not limited to water-based sprinklers/standpipes (e.g., wet, dry, preaction, foam, deluge, water mist, antifreeze), specialty systems (e.g., clean agent, carbon dioxide, hybrid, wet and dry chemical fire suppression systems), and supplemental fire detection systems (e.g., hydraulic, pneumatic, electrical). Their duties also include reading, interpreting and modifying engineered drawings and 3-D models, installing hangers, bracing, supports and restraints to support the piping system, preparing and joining pipe using a variety of methods, installing piping components, and installing water supplies and associated equipment including fire pumps, storage tanks and cross-connection control.

Sprinkler fitters usually, but not exclusively, work on industrial, institutional, commercial and residential sites such as office buildings, plants, factories, hospitals, hotels, houses, apartment buildings, airports and care homes. They may work for trade contractors, facility maintenance departments, and servicing companies. They may also be self-employed (e.g., labour contractors). Sprinkler fitters may specialize in installation, service, inspection, testing and maintenance.

Sprinkler fitters use tools and equipment such as hand tools, portable and stationary power tools, measuring and testing equipment, digital technology, access equipment, and rigging, hoisting and lifting equipment.

Sprinkler fitters work primarily indoors, often in unheated or temporarily heated spaces. They may also be required to install outdoor systems both above and below ground. The installation of sprinkler equipment takes place throughout all phases of construction, typically in the mid-to later stages of new construction or in situations where renovation of existing structures is undertaken, or upgrading is legislated. They are required to work in confined spaces and at heights. They may occasionally experience physical discomfort due to extensive lifting of various weights overhead, repetitive motion, temperature changes, vibration, noise, dust, and controlled hazardous environments.

Key attributes for people entering this trade are mechanical and mathematical aptitude, manual dexterity, good communication and problem-solving skills and the ability to pay close attention to detail. Physical strength and stamina, and the ability to work at a considerable height are also assets in this trade.

This standard recognizes similarities or overlaps with the work of plumbers and steamfitter-pipefitters.

Experienced sprinkler fitters may advance to positions such as designers, principal owners, supervisors, estimators, labour representatives, contractors, project managers, inspectors and instructors. They also act as mentors and trainers of apprentices in the trade.

Trends in the Sprinkler Fitter Trade

Technology

The sprinkler fitter trade is using advanced technology to work smarter and faster.

Mobile devices like smartphones and tablets are now important for looking up codes, standards, regulations, drawings, and job details at the work site. Digital document management helps keep important information organized and easy to access and transfer whether in the office or on-site.

Construction companies are using Building Information Modelling (BIM) to generate and manage digital representations of physical and functional characteristics of buildings. This digitization of building information allows sprinkler fitters to move away from physical prints and allows instant collaboration between owners, employers, employees, designers, engineers, contractors and other tradespeople.

Robotic total stations, laser scanners and reality capture equipment are emerging on work sites to increase the accuracy of installations. Digital tools like flowmeters and laser alignment devices also improve testing and monitoring of equipment.

Remote monitoring, inspection and testing technology is emerging in fire protection, allowing sprinkler fitters to troubleshoot and aid in diagnosing systems from a distance.

Health and Safety

New health and safety directives are providing awareness of hazards such as foam concentrates containing perfluorooctane sulfonate (PFOS)/perfluorooctanoic acid (PFOA), heavily chlorinated water being released into the environment and listed antifreeze solutions.

Sprinkler fitters are increasingly being supported in addressing and promoting mental health and well-being. Addiction treatment and mental health programs are becoming more accepted and available in the trade.

There is a greater emphasis on the 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.

Products/Materials

The sprinkler fitter industry is seeing big improvements in products and materials that help protect against fire. Some systems are now made specifically for protecting lithium-ion battery storage, which is important for new technologies. Ongoing testing has allowed Early Suppression Fast Response (ESFR) sprinklers to be permitted in storage occupancies with greater ceiling and stockpile heights.

Listed premixed antifreeze and foam system equipment are becoming more common, and there is a rise in the use of hybrid and water mist systems as cleaner options for putting out fires and conserving water. Nitrogen generators are being used as air maintenance on dry and preaction systems to aid in reducing corrosion. Nitrogen inerting is also being applied to wet pipe systems.

Environmental

The sprinkler fitter industry is paying more attention to being environmentally friendly. There is ongoing research about using clean agents to reduce the impact of fire protection systems on the environment while still keeping life and property safe from fires. Water conservation is also important, especially in areas with drought or limited water supplies.

Concerns about water pollution have led to actions like treating used drinking water in sensitive areas to lessen its environmental impact. It is important to have proper ways to divert and contain water to avoid polluting local water sources. Additionally, the use of additives in systems, like antifreeze and treatments for pipe corrosion, is being examined for their harmful chemicals such as volatile organic compounds (VOCs), highlighting the need for safer, eco-friendly options.

Waste management is another important focus. The industry is working to reduce waste from packaging and product disposal. Efforts include recycling metals, cardboard, and plastic, while also ensuring that hazardous waste like cutting oils and hydraulic fluids is disposed of safely. By recycling and reducing waste, along with using water and energy more efficiently, the industry aims to be more responsible and sustainable.

Fluorinated foam for firefighting is no longer available due to environmental and health impacts. Alternates to existing and new foam systems are fluorine-free foams and the incorporation of alternative environmentally friendly faux foam for testing of foam and deluge systems.

Legislative and Regulatory

The sprinkler fitter trade is always changing, and sprinkler fitters should remain current with adopted codes, standards and regulations in their jurisdiction and municipality.

New regulations for foam concentrates, listed antifreeze solutions and clean agents are emerging, which could greatly affect how fire protection is done. Also, legislation to permit greater enforcement continues to evolve for inspection, testing, and maintenance (ITM) work.

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

Sprinkler fitters read texts such as short descriptions, warnings and directions on labels for products. They read codes, standards, regulations, specifications, bulletins, manuals, work orders, reports, documents and procedures when installing, testing, servicing, operating, diagnosing, maintaining, inspecting and repairing equipment. They also read emails, texts and memos from supervisors, co-workers and suppliers about ongoing work.

Document Use

Sprinkler fitters scan and locate data on labels, lists, tables and schedules. They reference codes, standards and regulations such as National Fire Protection Association (NFPA) and National Building Code (NBC). They may interpret graphs and data when monitoring equipment operation. They interpret or review schematics and engineered drawings of systems (mechanical, electrical, structural, pneumatic and hydraulic). Sprinkler fitters may also retrieve and study data from various scaled drawings to identify and verify the location of equipment to be installed. They also complete forms such as test certificates, safety documents, purchase orders, inspection reports, maintenance forms, apprentice evaluation and progress books, logbooks, time sheets and work orders.

Writing

Sprinkler fitters write brief text entries in logbooks and in forms. They may write maintenance, repair and safe work procedures. Sprinkler fitters write emails to clients, supervisors, co-workers and suppliers. They also make entries in apprentices logbooks for the apprenticeship program, write incident reports and update drawings.

Oral Communication

Sprinkler fitters talk to suppliers, engineers, contractors, co-workers, supervisors, other tradespeople, clients and members of the public about equipment specifications, access, orders, and delivery and service times. They discuss work orders, equipment troubleshooting and job task coordination with co-workers and other tradespeople. They also discuss safety, productivity, and procedural and policy changes at meetings with co-workers, supervisors, engineers and clients.

Numeracy

Sprinkler fitters measure various physical properties. Calculations are required in multiple aspects of the sprinkler fitter trade, such as pneumatic, hydraulic, mechanical and structural systems. They calculate distances, totals, maximums, minimums, tolerances, clearances and quantities required. They may calculate loads, weight, volume, capacities, speeds, velocities, flows and dimensions for mechanical components and systems. They perform calculations in order to adjust, level and align equipment according to specifications, and for diagnosing process variables. Sprinkler fitters assess weights and distances appropriate for rigging, hoisting, lifting and moving equipment.

Thinking

Thinking skills are critical to the sprinkler fitter trade. They need the ability to adapt on a day-to-day basis to site conditions, design, fabrication and installation issues, safety concerns, performance and productivity goals. They may assess the feasibility of designs for small modifications to fire protection systems, ensuring that designs meet technical specifications, performance requirements and jurisdictional regulations. Sprinkler fitters also troubleshoot fire protection systems.

Working with Others

Sprinkler fitters are required to work independently, with other sprinkler fitters, other tradespeople, personnel from other departments and authority having jurisdiction (AHJ) depending on the scope of the work. They actively participate with apprentice training and progression on the job.

Digital Technology

Sprinkler fitters may use databases to perform queries on maintenance history, regulatory items and procedures. They may also enter data from completed work orders in a computerized maintenance management system (CMMS). They may use programs to aid in the adjustment of drawings with computer-assisted design (CAD) and BIM software. Sprinkler fitters use hand-held computerized alignment and levelling measurement tools. They may use word processing software to write, edit and format texts such as incident reports and maintenance procedures. They may access work orders, asset information and documents on tablets, phones and other electronic devices.

Continuous Learning

Sprinkler fitters read manuals and trade-related documents to stay up to date on developments in their trade. They also attend training sessions (online or classroom-based) on new technologies, equipment and safety procedures. In addition, they learn informally by communicating with co-workers and suppliers.

Roles and Opportunities for Skilled Trades in a Sustainable Future

Climate change and the environment is an important issue for many Canadians and the skilled trades play a large role in implementing solutions.

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

Here are a few examples:

- Construction tradespeople need to consider the materials they are using, building methods, and technological improvements to mechanical and electrical installations. Efficiency upgrades and advanced materials are changing the construction industry in Canada. Improvements to energy efficiency in building structures and systems are continual, and codes, specifications and designs such as Leadership in Energy and Environmental Design (LEED) and the Zero Carbon Building (ZCB) standards outline how the construction trades can improve the efficiency and sustainability of the industry.
- Automotive and mechanical trades are seeing shifts to more efficient vehicles and advanced materials, including alternate fuels and electric vehicles. With the continual and rapid evolution of technology in this sector, there is a need for skilled workers to always be learning.
- Manufacturing sectors face global competition resulting in a move towards increased efficiency and automation. Many industrial and commercial facilities are being upgraded to improve efficiency in areas such as lighting systems, building envelope airtightness, mechanical insulation, heat pumps and new production processes and technologies. New control technologies allow better monitoring of processes resulting in less waste and higher-quality products.
- Industrial trades are being encouraged to reduce greenhouse gas and carbon emissions by supporting development of carbon capture, utilization and storage (CCUS) and renewable energy generation such as solar, wind, hydro, geothermal and nuclear generation, as well as upgrades to transmission and distribution infrastructure. Systems designed to recover natural gas (RNG) produced by landfill, digesters, and biogas facilities, and hydrogen production and utilization provide many opportunities for future projects.
- Landscape horticulturists will have opportunities to design and develop biodiverse ecosystems to mitigate the effects of climate change. Concerns such as erosion, species diversity and ecosystem health can be addressed through the use of green infrastructure systems.
- Service sector trades may also need to be aware of responsible sourcing, as well as the efficient use of products and materials. The increasing popularity of ecotourism will provide opportunities in new areas.

There are fast-moving changes in guidelines, codes, regulations, international agreements, and manufacturers' specifications implemented for the purpose of energy efficiency and mitigating climate change. Tradespeople need to continually stay on top of new and changing requirements to stay competitive.

Apprentices and tradespeople need to increase their climate literacy and reinforce their own understanding of current climate change, energy conservation and environmental practices. Most trades are encouraged to use ecologically friendly products and follow requirements related to the reuse, recycling or disposal of materials. While individual tradespeople and apprentices may not be able to choose certain elements (like the architectural design of buildings, building material selection, regulatory requirements, or use of electric vehicles and technologies), understanding the impact of using these elements and how to apply them in their work is still important. This helps ensure that energy and environmental specifications are fully met.

In apprenticeship training, 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.

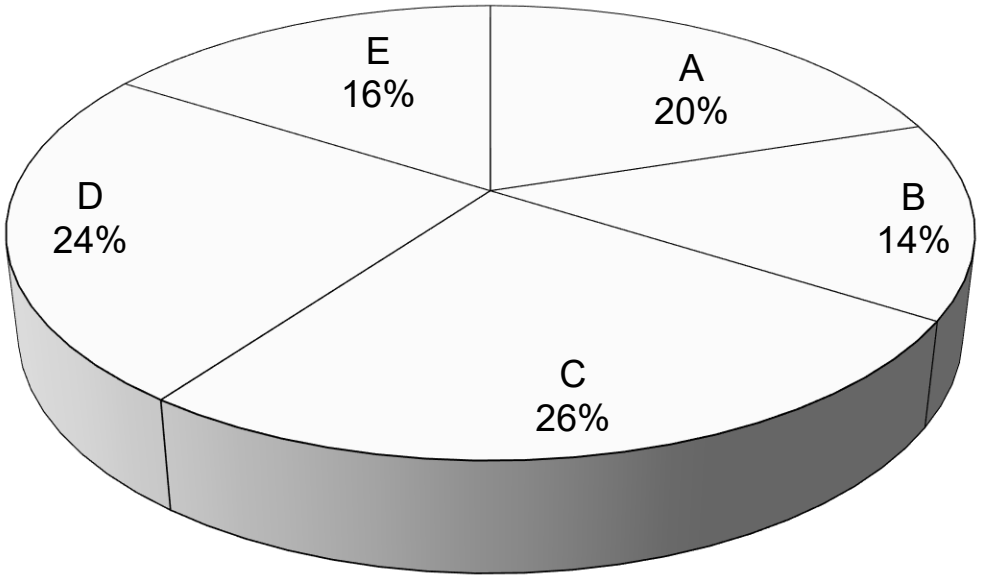
Industry Expected Performance

All tasks must be performed according to the applicable jurisdictional codes, standards and regulations. 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. Requirements of the manufacturer, client specifications, the National Fire Protection Association (NFPA), Underwriter Laboratories of Canada (ULC), Factory Mutual (FM), National Building Code (NBC), National Fire Code (NFC), provincial building and fire codes, and AHJ must be met. At a journey person level of performance, all tasks must be done with minimal direction and supervision. As a journey person progresses in their career, there is an expectation that they continue to upgrade their skills and knowledge. This allows them to maintain pace with industry, promote continuous learning in their trade and be a better mentor to their apprentices.

Language Requirements

It is expected that journey persons 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	20%
B— Installs water supply	14%
C—Installs piping	26%
D—Installs and lays out fire protection systems and devices	24%
E—Inspects, tests and maintains (ITM) fire protection systems	16%

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

Task Matrix and Weightings

Major Work Activity A—Performs common occupational skills 20%

Task A-1 Maintains safe and healthy workplace 25%	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 Performs lockout/tagout procedures
	Sub-task A-1.04 Performs work in confined space	Sub-task A-1.05 Participates in healthy and respectful workplace practices	
Task A-2 Uses and maintains tools and equipment 21%	Sub-task A-2.01 Uses hand tools	Sub-task A-2.02 Uses portable and stationary power tools	Sub-task A-2.03 Uses measuring and testing equipment
	Sub-task A-2.04 Uses access equipment	Sub-task A-2.05 Uses rigging, hoisting and lifting equipment	Sub-task A-2.06 Uses soldering and brazing equipment
Task A-3 Organizes work 30%	Sub-task A-3.01 Interprets codes, standards, regulations and procedures	Sub-task A-3.02 Uses drawings and specifications	Sub-task A-3.03 Uses documentation and reference material
	Sub-task A-3.04 Plans job tasks and procedures	Sub-task A-3.05 Prepares work site	Sub-task A-3.06 Performs layout of systems
Task A-4 Commissions systems 24%	Sub-task A-4.01 Commissions water supply systems	Sub-task A-4.02 Commissions water-based fire protection systems	Sub-task A-4.03 Commissions specialty fire suppression systems

Task A-5 Maintains continuous learning 0%	Sub-task A-5.01 Upgrades in new trade practices and procedures	Sub-task A-5.02 Upgrades in emerging technologies
Task A-6 Uses communication and mentoring techniques 0%	Sub-task A-6.01 Uses communication techniques	Sub-task A-6.02 Uses mentoring techniques

Major Work Activity B—Installs water supply 14%

Task B-7 Installs underground water supplies 19%	Sub-task B-7.01 Supervises trenching and backfilling	Sub-task B-7.02 Installs underground piping and components	Sub-task B-7.03 Flushes underground system
Task B-8 Installs fire pump units 40%	Sub-task B-8.01 Determines location of pumps, drivers, controllers and components	Sub-task B-8.02 Installs pumps, drivers, controllers and components	
Task B-9 Installs fire department connections 25%	Sub-task B-9.01 Determines location, size and type of fire department connections	Sub-task B-9.02 Installs fire department connections, piping and components	
Task B-10 Installs private water supply systems 16%	Sub-task B-10.01 Installs water tanks	Sub-task B-10.02 Installs related equipment	

Major Work Activity C—Installs piping 26%

Task C-11 Prepares pipe, tube and fittings for installation 29%	Sub-task C-11.01 Cuts pipe and tube	Sub-task C-11.02 Bends pipe and tube	Sub-task C-11.03 Threads pipe
	Sub-task C-11.04 Grooves pipe and tube	Sub-task C-11.05 Drills pipe and tube	Sub-task C-11.06 Grinds pipe
	Sub-task C-11.07 Prepares fittings		
Task C-12 Installs pipe, tube and fittings 36%	Sub-task C-12.01 Installs steel pipe, tube and fittings	Sub-task C-12.02 Installs non-metallic pipe, tube and fittings	Sub-task C-12.03 Installs copper pipe, tube and fittings
	Sub-task C-12.04 Paints and labels pipe, tube and fittings		
Task C-13 Installs piping components 35%	Sub-task C-13.01 Selects sprinklers and nozzles	Sub-task C-13.02 Installs sprinklers and nozzles	Sub-task C-13.03 Installs pipe sleeves
	Sub-task C-13.04 Installs hangers, supports, restraints and bracing	Sub-task C-13.05 Installs cross-connection control assemblies	Sub-task C-13.06 Installs system drainage

Major Work Activity D—Installs and lays out fire protection systems and devices 24%

Task D-14 Installs water-based systems 48%	Sub-task D-14.01 Installs wet pipe systems	Sub-task D-14.02 Installs dry pipe systems	Sub-task D-14.03 Installs preaction/deluge systems
	Sub-task D-14.04 Installs antifreeze systems	Sub-task D-14.05 Installs foam systems	Sub-task D-14.06 Installs water mist and hybrid systems
	Sub-task D-14.07 Installs standpipe and hose systems	Sub-task D-14.08 Modifies existing systems	
Task D-15 Installs specialty fire suppression systems and equipment 20%	Sub-task D-15.01 Installs dry and wet chemical, clean agent and carbon dioxide systems	Sub-task D-15.02 Installs portable extinguishers	
Task D-16 Installs detection devices 13%	Sub-task D-16.01 Installs wet and dry pilot lines	Sub-task D-16.02 Installs heat-actuated devices (HADs)	Sub-task D-16.03 Installs spark detection systems
	Sub-task D-16.04 Installs air sampling systems	Sub-task D-16.05 Installs electrical detection systems NOT COMMON CORE	
Task D-17 Installs signal-initiating devices 19%	Sub-task D-17.01 Installs alarm-initiating devices	Sub-task D-17.02 Installs supervisory-initiating devices	

Major Work Activity E—Inspects, tests and maintains (ITM) fire protection systems 16%

Task E-18 Inspects and tests water-based fire protection systems 37%	Sub-task E-18.01 Performs scheduled inspections of water-based fire protection systems	Sub-task E-18.02 Performs scheduled tests of water-based fire protection systems	
Task E-19 Maintains and repairs water-based fire protection systems 34%	Sub-task E-19.01 Troubleshoots water-based fire protection systems	Sub-task E-19.02 Repairs deficiencies of water-based fire protection systems	Sub-task E-19.03 Performs scheduled maintenance of water-based fire protection systems
Task E-20 Inspects and tests specialty fire suppression systems and equipment 16%	Sub-task E-20.01 Performs scheduled inspections of specialty fire suppression systems	Sub-task E-20.02 Performs scheduled tests of specialty fire suppression systems and equipment	Sub-task E-20.03 Performs scheduled inspections of portable fire extinguishers
Task E-21 Maintains and repairs specialty fire suppression systems and equipment 13%	Sub-task E-21.01 Troubleshoots specialty fire suppression systems and equipment	Sub-task E-21.02 Repairs deficiencies of specialty fire suppression systems and equipment	Sub-task E-21.03 Performs scheduled maintenance of specialty fire suppression systems and equipment

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 Sprinkler Fitter.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for this trade is 4.

3. Total Training Hours

The total hours of training, including both on-the-job and in-school training for this trade is 7200.

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	Level 4
	Context	Context	Context
	Health and Safety-Related Functions	Health and Safety-Related Functions	Health and Safety-Related Functions
	Tools and Equipment	Tools and Equipment	Tools and Equipment
	Organizes Work	Organizes Work	Organizes Work
	Pipe, Tube and Fittings (Prepare)	Pipe, Tube and Fittings (Prepare)	Pipe, Tube and Fittings (Prepare)
	Pipe, Tube and Fittings (Installs)	Pipe, Tube and Fittings (Installs)	Pipe, Tube and Fittings (Installs)
		Signal-Initiating Devices (Installs)	Signal-Initiating Devices (Installs)

Health and Safety-Related Functions

1.01 Maintains safe work environment

1.02 Uses personal protective equipment (PPE) and safety equipment

1.03 Performs lockout/tagout procedures

1.04 Performs work in confined space

1.05 Participates in healthy and respectful workplace practices

Level 1	Level 2	Level 3	Level 4
Tools and Equipment 2.01 Uses hand tools 2.02 Uses portable and stationary power tools 2.03 Uses measuring and testing equipment 2.04 Uses access equipment 2.05 Uses rigging, hoisting and lifting equipment 2.06 Uses soldering and brazing equipment	Tools and Equipment 2.05 Uses rigging, hoisting and lifting equipment		
Organizes Work 3.01 Interprets codes, standards, regulations and procedures 3.02 Uses drawings and specifications 3.03 Uses documentation and reference material	Organizes Work 3.01 Interprets codes, standards, regulations and procedures 3.02 Uses drawings and specifications 3.03 Uses documentation and reference material 3.05 Prepares work site 3.06 Performs layout of systems	Organizes Work 3.01 Interprets codes, standards, regulations and procedures 3.02 Uses drawings and specifications 3.06 Performs layout of systems	Organizes Work 3.01 Interprets codes, standards, regulations and procedures 3.03 Uses documentation and reference material 3.04 Plans job tasks and procedures 3.06 Performs layout of systems

Level 1	Level 2	Level 3	Level 4
		Commissions Systems 4.01 Commissions water supply systems 4.02 Commissions water-based fire protection systems	Commissions Systems 4.03 Commissions specialty fire suppression systems
			Continuous Learning 5.01 Upgrades in new trade practices and procedures 5.02 Upgrades in emerging technologies
Communication 6.01 Uses communication techniques 6.02 Uses mentoring techniques			Mentoring 6.01 Uses communication techniques 6.02 Uses mentoring techniques
		Underground Water Supplies 7.01 Supervises trenching and backfilling 7.02 Installs underground piping and components 7.03 Flushes underground system	

Level 1	Level 2	Level 3	Level 4
		Fire Pump Units 8.01 Determines location of pumps, drivers, controllers and components 8.02 Installs pumps, drivers, controllers and components	
		Fire Department Connections 9.01 Determines location, size and type of fire department connections 9.02 Installs fire department connections, piping and components	
		Private Water Supply Systems 10.01 Installs water tanks 10.02 Installs related equipment	

Level 1	Level 2	Level 3	Level 4
Pipe, Tube and Fittings (Prepare) 11.01 Cuts pipe and tube 11.02 Bends pipe and tube 11.03 Threads pipe 11.04 Grooves pipe and tube 11.05 Drills pipe and tube 11.06 Grinds pipe 11.07 Prepares fittings			
Pipe, Tube and Fittings (Installs) 12.01 Installs steel pipe, tube and fittings 12.02 Installs non-metallic pipe, tube and fittings 12.03 Installs copper pipe, tube and fittings 12.04 Paints and labels pipe, tube and fittings			

Level 1	Level 2	Level 3	Level 4
Piping Components 13.01 Selects sprinklers and nozzles 13.02 Installs sprinklers and nozzles 13.03 Installs pipe sleeves 13.04 Installs hangers, supports, restraints and bracing	Piping Components 13.01 Selects sprinklers and nozzles 13.02 Installs sprinklers and nozzles 13.04 Installs hangers, supports, restraints and bracing 13.06 Installs system drainage	Piping Components 13.04 Installs hangers, supports, restraints and bracing 13.05 Installs cross-connection control assemblies 13.06 Installs system drainage	
Water-Based Systems 14.01 Installs wet pipe systems 14.04 Installs antifreeze systems	Water-Based Systems 14.02 Installs dry pipe systems 14.03 Installs preaction/deluge systems	Water-Based Systems 14.07 Installs standpipe and hose systems	Water-Based Systems 14.05 Installs foam systems 14.06 Installs water mist and hybrid systems 14.08 Modifies existing system
		Specialty Fire Suppression Systems and Equipment 15.02 Installs portable extinguishers	Specialty Fire Suppression Systems and Equipment 15.01 Installs dry and wet chemical, clean agent and carbon dioxide systems
	Detection Devices (Installs) 16.01 Installs wet and dry pilot lines 16.02 Installs heat-actuated devices (HADs) 16.05 Installs electrical detection systems		Detection Devices (Installs) 16.03 Installs spark detection systems 16.04 Installs air sampling systems 16.05 Installs electrical detection systems

Level 1	Level 2	Level 3	Level 4
	Signal-Initiating Devices (Installs) 17.01 Installs alarm-initiating devices 17.02 Installs supervisory-initiating devices		
			Inspection and Testing of Water-Based Fire Protection Systems 18.01 Performs scheduled inspections of water-based fire protection systems 18.02 Performs scheduled tests of water-based fire protection systems
			Maintenance and Repair of Water-Based Fire Protection Systems 19.01 Troubleshoots water-based fire protection systems 19.02 Repairs deficiencies of water-based fire protection systems 19.03 Performs scheduled maintenance of water-based fire protection systems

Level 1	Level 2	Level 3	Level 4
		Inspection and Testing of Fire Suppression Systems and Equipment 20.03 Performs scheduled inspections of portable fire extinguishers	Inspection and Testing of Fire Suppression Systems and Equipment 20.01 Performs scheduled inspections of fire suppression systems 20.02 Performs scheduled tests of fire suppression systems and equipment
			Maintenance and Repair of Fire Suppression Systems and Equipment 21.01 Troubleshoots fire suppression systems and equipment 21.02 Repairs deficiencies of fire suppression systems and equipment 21.03 Performs scheduled maintenance of fire suppression systems and equipment

Major Work Activity A—Performs common occupational skills

Task A-1 Maintains safe and healthy workplace

Task Descriptor

Sprinkler fitters participate in maintaining a safe work environment. 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. Sprinkler fitters perform lockout/tagout procedures before working on systems to prevent negative impacts on the environment, spills, property damage, personal injury, and fatalities. They work in confined spaces, at heights, in occupied areas and in all weather conditions. They must ensure through procedures and documentation, that the requirements of Occupational Health and Safety (OHS) are being met. Sprinkler fitters contribute to ensuring a healthy and inclusive workplace. Canada has aligned the Workplace Hazardous Materials Information System (WHMIS) with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). For the purpose of this document, this will be indicated as WHMIS (GHS).

A-1.01 Maintains safe work environment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-1.01.01P	follow **specified safety procedures**	**specified safety procedures** are followed according to OHS regulations, company policies and site-specific requirements
A-1.01.02P	identify and document **workplace hazards**	**workplace hazards** are identified and documented according to site-specific requirements

Reference Code	Performance Criteria	Evidence of Attainment
A-1.01.03P	execute hazard mitigation strategies	hazard mitigation strategies are executed according to OHS regulations, company policies and site-specific requirements to prevent injuries to self and others
A-1.01.04P	maintain clean and tidy work site	clean and tidy work site is maintained to avoid injuries to self and others
A-1.01.05P	coordinate tasks	tasks with other workers are coordinated to avoid injury to self and others
A-1.01.06P	place flagging, pylons and signage	flagging, pylons and signage are placed when working in high-traffic areas to avoid injury to others
A-1.01.07P	recognize, handle, store, label and document **hazardous materials**	**hazardous materials** are recognized, handled, stored, labelled and documented according to **WHMIS (GHS)** and controlled products regulations
A-1.01.09P	locate and interpret **WHMIS (GHS)** materials	directions on safety data sheets (SDS) are verified and followed (use of PPE and ventilation)
A-1.01.10P	participate in safety meetings and discussions	safety meetings and discussions are participated in to ensure information is understood, shared and documented
A-1.01.11P	recognize and report unsafe conditions and **workplace hazards**	unsafe conditions and **workplace hazards** are recognized, reported and documented to ensure they are mitigated
A-1.01.13P	address or correct **workplace hazard**	**workplace hazard** is mitigated or eliminated, and information is documented and communicated to supervisor and Health and Safety representative immediately
A-1.01.14P	complete **safety-related documentation**	**safety-related documentation** is completed and submitted according to company policies

Range of Variables (include, but not limited to)

specified safety procedures: aerial lift training, fall arrest protection, hot work, confined space permits, travel restraint, using PPE, following site-specific requirements

workplace hazards: systems under pressure, rotating equipment, working at heights, working around hazardous materials, other work being performed in the area, poor housekeeping, overhead hazards, tripping hazards, trenching and shoring hazards, electrical hazards, confined space hazards, hot work hazards, silica and asbestos hazards, noise hazards, environmental hazards, vibration hazards, air quality hazards, falling hazards, stress, pinch points, heavy objects, dust, exposed fibres, burrs, sparks, fumes, sharp edges, burns

hazardous materials: glues, thread lubricant, cutting oil, glycol, solvents, compressed gas cylinders, additives, asbestos, fuel, battery acid, radioactive and toxic materials

WHMIS (GHS): awareness, labelling, use of PPE, first aid, proper disposal procedures

safety-related documentation: field-level risk assessment (FLRA), pre-safety inspection (PSI), lift plans, hazard assessments (HA), near miss and accident reports, equipment and PPE inspections, toolbox talk, safety meeting minutes, WHMIS (GHS) documents

Knowledge

Reference Code	Learning Outcomes and Objectives
A-1.01.01L	demonstrate knowledge of safe work practices
a.	identify **workplace hazards** and describe safe work practices
b.	identify classes of fires, and describe procedures to select and use fire-extinguishing equipment
c.	interpret information about safety found on drawings and specifications
A-1.01.02L	demonstrate knowledge of processes to maintain safe work environment
a.	describe company safety policies and procedures
b.	identify **work environment protection** used to maintain safe work environment, and describe procedures for use
c.	identify common causes of accidents and **workplace hazards**, and describe procedures to mitigate and eliminate potential risks
d.	describe procedures to handle, store, label, transport, safely dispose of or recycle **hazardous materials**
e.	describe fundamentals of housekeeping
f.	describe procedures to inspect work environment

Reference Code	Learning Outcomes and Objectives
A-1.01.03L	demonstrate knowledge of documentation about workplace safety
a.	develop workplace safety analysis and assessments
b.	document **workplace hazards**
c.	identify **safety-related documentation**, and describe their purpose and application
A-1.01.04L	demonstrate knowledge of regulatory requirements for maintaining safe work environment
a.	identify jurisdictional health and safety regulations
b.	identify codes, standards and regulations for safety
c.	identify and interpret workplace safety and health regulations
d.	describe federal, jurisdictional and municipal regulations and practices related to safe disposal of hazardous products
e.	describe company or jurisdictional procedures for emergency response
f.	identify responsibilities regarding site-specific safety policies and procedures
A-1.01.05L	demonstrate knowledge of environmental regulations and considerations to maintain safe work environment
a.	identify environmental regulations and considerations when maintaining safe work environment
b.	identify environmentally friendly products that promote a healthy work site

Range of Variables (include, but not limited to)

workplace hazards: systems under pressure, rotating equipment, working at heights, working around hazardous materials, other work being performed in the area, poor housekeeping, overhead hazards, tripping hazards, trenching and shoring hazards, electrical hazards, confined space hazards, hot work hazards, silica and asbestos hazards, noise hazards, environmental hazards, vibration hazards, air quality hazards, falling hazards, stress, pinch points, heavy objects, dust, exposed fibres, burrs, sparks, fumes, sharp edges, burns

work environment protection: hoarding, fire blankets, flash screens, barrier tape, barriers, lockouts, bump lines, guard rails

hazardous materials: glues, thread lubricant, cutting oil, glycol, solvents, compressed gas cylinders, additives, asbestos, fuel, battery acid, radioactive and toxic materials

safety-related documentation: FLRA, PSI, HA, near miss and accident reports, equipment and PPE inspections, toolbox talk, safety meeting minutes, WHMIS (GHS) documents

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	yes	yes	yes	yes	yes	yes	NV	NV	NV

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-1.02.01P	select and use **PPE**	**PPE** is selected, adjusted, worn and used according to task and as identified by site policies and jurisdictional regulations
A-1.02.02P	locate and use **safety equipment**	**safety equipment** is located and used according to manufacturers' specifications, jurisdictional regulations and task
A-1.02.03P	inspect, identify and label **outdated or damaged PPE and safety equipment**	**PPE** and **safety equipment** is inspected, and wear or damage is identified and labelled according to manufacturers' specifications and jurisdictional regulations
A-1.02.04P	maintain **PPE** and **safety equipment**	**PPE** and **safety equipment** is maintained according to manufacturers' specifications and jurisdictional regulations
A-1.02.05P	store **PPE** and **safety equipment**	**PPE** and **safety equipment** is stored in an accessible manner and according to manufacturers' specifications

Range of Variables (include, but not limited to)

PPE: basic PPE (hard hats, safety glasses, gloves, face shields, dust masks, respirators, hearing protection, safety boots, high-visibility vests), fall arrest protection, travel restraints, specialized (site specific) PPE

safety equipment: fire extinguishers, eye wash stations, first-aid kits, spill kits, air-monitoring devices, organic respirators

outdated or damaged PPE and safety equipment: expired hard hats, excessively worn boots, cracked safety glasses, worn harnesses, old hearing protection

Knowledge

Reference Code	Learning Outcomes and Objectives
A-1.02.01L	demonstrate knowledge of **PPE** and **safety equipment**, their characteristics and applications
a.	identify types of **PPE**, and describe their characteristics and applications
b.	identify types and location of site **safety equipment**, and describe their characteristics and applications
c.	interpret information about **PPE** and **safety equipment** found on-site and in manufacturers' documents
A-1.02.02L	demonstrate knowledge of procedures to use and maintain **PPE** and **safety equipment**
a.	describe procedures to use **PPE** and **safety equipment**
b.	describe procedures to inspect, maintain and store **PPE** and **safety equipment**
c.	identify **workplace hazards**, and describe safe work practices and mitigation strategies
A-1.02.03L	demonstrate knowledge of training and certification requirements to use and maintain **PPE** and **safety equipment**
a.	identify training and certification requirements to use and maintain **PPE** and **safety equipment**
A-1.02.04L	demonstrate knowledge of regulatory requirements for workplace safety
a.	identify and interpret workplace safety and health regulations
A-1.02.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle **PPE** and **safety equipment**

Range of Variables (include, but not limited to)

PPE: basic PPE (hard hats, safety glasses, gloves, face shields, dust masks, respirators, hearing protection, safety boots, high-visibility vests), fall arrest protection, travel restraints, specialized (site specific) PPE

safety equipment: fire extinguishers, eye wash stations, first-aid kits, spill kits, air-monitoring devices, organic respirators

workplace hazards: personal (confined space, working at heights, lifting and ergonomics, trenches), workplace (hot work, lockout/tagout, high voltage, rotating equipment, barricades and flagging, radiation, extreme temperatures, noise, access equipment [ladders, scaffolding, swing stages, power-elevated work platforms]), environmental (hazardous materials, quality of air, fumes, system drainage and disposal requirements)

A-1.03 Performs lockout/tagout procedures

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-1.03.01P	select and use tools and equipment	tools and equipment are selected and used according to task
A-1.03.02P	determine lockout/tagout requirements for system components	requirements for lockout/tagout are met according to **regulations**, local AHJ and site-specific guidelines
A-1.03.03P	obtain and install **lockout/tagout equipment**	**lockout/tagout equipment** is installed according to task and site-specific requirements
A-1.03.04P	complete **documentation**	**documentation** for lockout/tagout is signed according to company policies, workplace requirements and procedures
A-1.03.05P	apply **isolation methods**	**isolation methods** are applied to system being locked out and system is de-energized
A-1.03.06P	remove designated **lockout/tagout equipment**	designated **lockout/tagout equipment** is removed according to task and site-specific requirements
A-1.03.07P	remove **isolation methods**	**isolation methods** are removed according to task and site-specific requirements

Range of Variables (include, but not limited to)

regulations: OHS, federal, provincial, municipal

lockout/tagout equipment: lock and key, chains and tags, lockout hasp, lockbox, blanks, valve lockouts

documentation: lockout/tagout permits, toolbox meeting reports, sign-in and sign-out sheets, FLRA

isolation methods: blinding, breaker locks, opening low point valves, checking gauges and switches, inspecting sight glasses

Knowledge

Reference Code	Learning Outcomes and Objectives
A-1.03.01L	demonstrate knowledge of **lockout/tagout equipment**, their components, characteristics, applications and operation
a.	identify **lockout/tagout equipment**, and describe their characteristics and applications
b.	describe operating principles of **lockout/tagout equipment**
c.	interpret information about **lockout/tagout equipment** found in manufacturers' specifications and workplace documents
A-1.03.02L	demonstrate knowledge of procedures to use **lockout/tagout equipment**
a.	identify tools and equipment used to install and remove **lockout/tagout equipment**, and describe their procedures for use
b.	identify workplace hazards and describe safe work practices for lockout/tagout procedures
c.	describe procedures to lock out/tag out
d.	describe **isolation methods**
e.	identify **documentation** that must be completed
f.	describe procedures to inspect and maintain **lockout/tagout equipment**
A-1.03.03L	demonstrate knowledge of training and certification requirements to use **lockout/tagout equipment**
a.	identify training and certification requirements to use **lockout/tagout equipment**
A-1.03.04L	demonstrate knowledge of regulatory requirements for using **lockout/tagout equipment**
a.	identify codes, standards and **regulations** for using **lockout/tagout equipment**
A-1.03.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle **lockout/tagout equipment**
A-1.03.06L	demonstrate knowledge of emerging technologies and practices for **lockout/tagout equipment**
a.	identify emerging technologies that enhance **lockout/tagout equipment** and procedures

Range of Variables (include, but not limited to)

lockout/tagout equipment: lock and key, chains and tags, lockout hasp, lockbox, blanks, valve lockouts

isolation methods: blinding, breaker locks, opening low point valves, checking gauges and switches, inspecting sight glasses

documentation: lockout/tagout permits, toolbox meeting reports, sign-in and sign-out sheets, FLRA

regulations: OHS, federal, provincial, municipal

A-1.04 Performs work in confined space

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-1.04.01P	select and use tools and equipment	tools and equipment are selected and used according to task
A-1.04.02P	confirm if area has been classified as a **confined space** prior to entry	**confined space** classification is confirmed through pre-job hazard assessment completion
A-1.04.03P	determine if **confined space** is safe for entry	**confined space** is determined safe for entry according to OHS and **confined space information**
A-1.04.04P	determine **hazards of confined space**	**hazards of confined space** are identified, and necessary safety equipment is implemented
A-1.04.05P	recognize and report emergency situations to emergency personnel	emergency situations are recognized and reported to emergency personnel according to situation and site policies
A-1.04.06P	direct evacuation of **confined space**	evacuation of **confined space** is directed according to rescue plan
A-1.04.07P	document personnel entering and exiting **confined space**, and verify that they are wearing PPE	personnel entering and exiting **confined space** are documented, and verified for PPE according to entry permit

Reference Code	Performance Criteria	Evidence of Attainment
A-1.04.08P	ensure permits are obtained and verified	permits are obtained and verified prior to personnel entering **confined space** according to site-specific requirements, jurisdictional regulations, and company policies and procedures
A-1.04.09P	monitor and document atmospheric conditions of **confined space**	atmospheric conditions of **confined space** are monitored and documented according to entry permit
A-1.04.10P	maintain constant contact with personnel in **confined space**	constant contact with personnel in **confined space** is maintained using various **methods**
A-1.04.11P	secure **confined space** during inactivity	**confined space** is secured according to site policies and OHS

Range of Variables (include, but not limited to)

confined space: crawl spaces, trenches, tanks, service chases, elevator shafts, attics, ceilings, vaults, tunnels, pits, under stages, freezers and coolers

confined space information: location, work description, hazard control, atmosphere testing, date and time, rescue plan

hazards of confined space: air quality, lack of accessibility, location, hazards of contents, hazardous atmosphere, lack of ventilation, sludge in confined space, exceeding lower and upper explosive limits, presence of toxic or flammable material, falling hazards, excessive noise, electrical hazards, radioactive material, engulfment, physical hazards, oxygen deficiencies

methods: visual, verbal, radios, cellphones, rope connections, hand signals

Knowledge

Reference Code	Learning Outcomes and Objectives
A-1.04.01L	demonstrate knowledge of **confined space**
a.	define **confined space**
b.	identify **confined space** requiring monitoring
c.	identify **hazardous gases** in **confined space** environment
d.	describe site-specific requirements for monitoring **confined space**

Reference Code	Learning Outcomes and Objectives
A-1.04.02L	demonstrate knowledge of procedures to monitor and secure **confined space**
a.	identify situations that require **specialty safety equipment**
b.	describe procedures to verify entry permit
c.	identify **confined space monitoring equipment**, and describe their characteristics and applications
d.	identify potential **hazards of confined space**, and describe associated safety procedures
e.	describe **considerations to preplan** confined space entry
f.	describe **confined space** rescue plans and procedures
g.	describe **methods** used to secure **confined space** during inactivity
h.	identify procedures to secure **confined space** during inactivity
i.	describe de-energization and lockout procedures
A-1.04.03L	demonstrate knowledge of first aid training and certification requirements for confined space entry
a.	identify first aid training and certification requirements for confined space entry
A-1.04.04L	demonstrate knowledge of training and certification requirements for confined space entry
a.	identify training and certification requirements for confined space entry
A-1.04.05L	demonstrate knowledge of regulatory requirements for confined space entry
a.	identify codes, standards and regulations of confined space entry

Range of Variables (include, but not limited to)

confined space: crawl spaces, trenches, tanks, service chases, elevator shafts, attics, ceilings, vaults, tunnels, pits, under stages, freezers and coolers

hazardous gases: chlorine, carbon monoxide, hydrogen sulphides, nitrogen, argon, oxygen, acetylene, propane, sulphur dioxide

specialty safety equipment: air monitoring devices, organic respirators, dust mask, access equipment

confined space monitoring equipment: air horns, radios, flashlights, identification vests, gas monitors

hazards of confined space: air quality, lack of accessibility, location, hazards of contents, hazardous atmosphere, lack of ventilation, sludge in confined space, exceeding lower and upper explosive limits, presence of toxic or flammable material, falling hazards, excessive noise, electrical hazards, radioactive material, engulfment, physical hazards, oxygen deficiencies

considerations to preplan: atmospheric testing and monitoring procedures, PPE and safety equipment, ground-fault interrupters, explosion-proof lighting, rescue plan and equipment

methods: visual, verbal, radios, cellphones, rope connections, hand signals

A-1.05 Participates in healthy and respectful workplace practices

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-1.05.01P	perform self-assessment of physical and mental health	self-assessment of physical and mental health is performed, and health concerns are identified
A-1.05.02P	identify **supports and resources** for personal mental health	**supports and resources** for personal mental health are identified
A-1.05.03P	identify **techniques to manage health and wellness**	**techniques to manage health and wellness** are identified
A-1.05.04P	assess **personal job satisfaction**	**personal job satisfaction** is assessed, and concerns are discussed with management
A-1.05.05P	create plan identifying demands of the trade to manage work-life balance	plan identifying demands of the trade is created to manage work-life balance

Reference Code	Performance Criteria	Evidence of Attainment
A-1.05.06P	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), 9-8-8 (Suicide Crisis Helpline)

techniques to manage health and wellness: practising 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 recreational drugs before, during and after work; using personal hygiene habits

personal job satisfaction: location (e.g., in or out of town), 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 and Objectives
A-1.05.01L	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
A-1.05.02L	demonstrate knowledge of **techniques to manage health and wellness** and promote health and wellness in others
a.	describe stress and time management techniques
b.	identify supports to manage health and well-being of self and others
c.	describe techniques to manage health and wellness

Reference Code	Learning Outcomes and Objectives
A-1.05.03L	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-1.05.04L	demonstrate knowledge regarding 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 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, professional ethics (personal and/or corporate standards of behaviour expected by professionals); values and guiding principles to guide individuals in performing job functions

techniques to manage health and wellness: practising 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 recreational drugs before, during and after work; using personal hygiene habits

professional ethics: personal and/or corporate standards of behaviour expected by professionals, with 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; how to engage in the trade in a professional way, displaying accountability to the public, and maintaining public trust and credibility of the profession; define misconduct; support and promote anti-harassment, anti-discrimination and inclusion practices

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

Sprinkler fitters select, use and maintain tools and equipment to allow them to perform the tasks of their trade safely and efficiently. 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

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.01.01P	inspect hand tools	hand tools are inspected for **damage** or excessive wear that affects their function
A-2.01.02P	operate hand tools	hand tools are operated according to task and their intended purpose
A-2.01.03P	maintain hand tools	hand tools are lubricated and cleaned after use to prevent corrosion and sustain usability
A-2.01.04P	replace **hand tool parts**	**hand tool parts** are replaced according to manufacturers' specifications and function
A-2.01.05P	identify, tag and remove from service worn, damaged and defective hand tools	worn, damaged, or defective hand tools are identified, tagged, and removed from service and repaired or replaced according to manufacturers’ specifications
A-2.01.06P	store hand tools	hand tools are stored in a clean, dry and secure place to ensure they are easily located and are in operating condition

Range of Variables (include, but not limited to)

damage: mushroomed drift pins; dull saws and cutting blades; worn jaws on pipe wrenches; chipped cutting wheels; fractured, cracked or corroded equipment

hand tool parts: cutting blades, cutting wheels, pipe wrench jaws

Knowledge

Reference Code	Learning Outcomes and Objectives
A-2.01.01L	demonstrate knowledge of hand tools, their characteristics and applications
a.	identify types of hand tools, and describe their characteristics and applications
b.	describe operating principles of hand tools
c.	interpret information about hand tools found in manufacturers' specifications
A-2.01.02L	demonstrate knowledge of procedures to use and maintain hand tools
a.	identify workplace hazards, and describe safe work practices for using and maintaining hand tools
b.	describe procedures for using hand tools
c.	describe procedures to inspect and tag **damaged** or defective hand tools
d.	identify defects and criteria for replacement, repair or removal of hand tools
e.	describe procedures to clean, maintain and store hand tools
A-2.01.03L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle **damaged** hand tools

Range of Variables (include, but not limited to)

damaged: mushroomed drift pins, dull saws and cutting blades, worn jaws on pipe wrenches, chipped cutting wheels; fractured, cracked or corroded equipment

A-2.02 Uses portable and stationary power tools

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.02.01P	inspect portable and stationary power tools and their accessories for functionality	portable and stationary power tools and their accessories are inspected for **unsafe conditions** and to identify defects, faults and wear

Reference Code	Performance Criteria	Evidence of Attainment
A-2.02.02P	clean portable and stationary power tools	portable and stationary power tools are cleaned to ensure they are free from corrosion, safe and ready to use
A-2.02.03P	maintain portable and stationary power tools	portable and stationary power tools are maintained as part of preventive maintenance according to manufacturers' specifications
A-2.02.04P	set up and operate portable and stationary power tools	portable and stationary power tools are set up and operated according to manufacturers' specifications and company safe work procedures
A-2.02.05P	identify, tag and remove from service worn, damaged and defective power tools	worn, damaged, or defective power tools are identified, tagged, and removed from service and repaired or replaced according to manufacturers' specifications
A-2.02.06P	store portable and stationary power tools	portable and stationary power tools are stored in clean, dry and secure place to ensure they are in operating condition and easily located

Range of Variables (include, but not limited to)

unsafe conditions: missing parts, defective or missing guards, frayed cords, defective blades, missing ground, cut cords, breaks, burns, bends

Knowledge

Reference Code	Learning Outcomes and Objectives
A-2.02.01L	demonstrate knowledge of portable and stationary power tools, their characteristics and applications
a.	identify types of portable and stationary power tools, and describe their characteristics and applications
b.	describe operating principles of portable and stationary power tools
c.	interpret information about portable and stationary power tools found in manufacturers' specifications

Reference Code	Learning Outcomes and Objectives
A-2.02.02L	demonstrate knowledge of procedures to use and maintain portable and stationary power tools
a.	identify workplace hazards, and describe safe work practices for using and maintaining portable and stationary power tools
b.	describe procedures to use portable and stationary power tools
c.	describe procedures to inspect and tag worn, damaged or defective portable and stationary power tools
d.	identify **unsafe conditions** and criteria for replacement, repair or removal of portable and stationary power tools
e.	describe procedures to clean, maintain and store portable and stationary power tools
A-2.02.03L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of or recycle damaged portable and stationary power tools, batteries, and consumable parts and accessories

Range of Variables (include, but not limited to)

unsafe conditions: missing parts, defective or missing guards, frayed cords, defective blades, missing ground, cut cords, breaks, burns, bends

A-2.03 Uses measuring and testing equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.03.01P	perform and verify calibration of **equipment**	calibration of **equipment** is performed and verified, and is current according to calibration documentation and manufacturers' specifications
A-2.03.02P	operate measuring and testing equipment	measuring and testing equipment is operated and analyzed according to manufacturers' specifications and company safe work procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.03.03P	clean and drain measuring and testing equipment	measuring and testing equipment is cleaned and drained to prevent damage from freezing, corrosion and to prevent inaccurate readings
A-2.03.04P	identify, tag and remove from service damaged or defective measuring and testing tools	damaged or defective measuring and testing tools are identified, tagged, and removed from service and repaired or replaced according to manufacturers' specifications
A-2.03.05P	store measuring and testing equipment	measuring and testing equipment is stored to prevent freezing and mechanical damage

Range of Variables (include, but not limited to)

equipment (requires calibration): test gauges, cross-connection testing kits, refractometers, tachometers, flowmeters, pitot tube

Knowledge

Reference Code	Learning Outcomes and Objectives
A-2.03.01L	demonstrate knowledge of measuring and testing equipment, their characteristics and applications
a.	identify types of measuring and testing equipment, and describe their characteristics and applications
b.	describe operating principles of measuring and testing equipment
c.	interpret information about measuring and testing equipment found in manufacturers' specifications

Reference Code	Learning Outcomes and Objectives
A-2.03.02L	demonstrate knowledge of procedures to use and maintain measuring and testing equipment
a.	identify workplace hazards, and describe safe work practices for using and maintaining measuring and testing equipment
b.	describe procedures to use measuring and testing equipment
c.	describe procedures to inspect and tag measuring and testing equipment
d.	identify defects and criteria for replacement, repair or removal of measuring and testing equipment
e.	identify measuring and testing **equipment** that requires third-party calibration and documents
f.	describe procedures to clean, maintain and store measuring and testing equipment
A-2.03.03L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle damaged measuring and testing equipment

Range of Variables (include, but not limited to)

equipment (requires calibration): test gauges, cross-connection testing kits, refractometers, tachometers, flowmeters, pitot tube

A-2.04 Uses access equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.04.01P	select and use access equipment	access equipment is selected and used according to task, manufacturers' specifications, jurisdictional regulations, site-specific requirements, and company policies and safe work procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.04.02P	inspect access equipment	access equipment is inspected before every use for damage and missing components, decals and inspection tags
A-2.04.03P	interpret and adhere to scaffold tags	scaffold tags are interpreted and adhered to in order to assess whether scaffolding is ready and safe for use, and to determine fall arrest requirements according to site-specific requirements, and company policies and safe work procedures
A-2.04.04P	secure access equipment	access equipment is secured according to jurisdictional regulations, site-specific requirements, and company policies and safe work procedures
A-2.04.05P	erect, level and dismantle scaffolding	scaffolding is erected, levelled and dismantled according to task, jurisdictional regulations, site-specific requirements, and company policies and safe work procedures
A-2.04.06P	install **safety features**	**safety features** are installed according to task, jurisdictional regulations, site-specific requirements, and company policies and safe work procedures
A-2.04.07P	use access equipment	access equipment is used within operating limitations according to manufacturers' tags, literature, jurisdictional regulations, and company policies and safe work procedures
A-2.04.08P	inspect, identify, tag and remove from service worn, damaged or defective access equipment	worn, damaged or defective access equipment is inspected, identified, tagged and removed from service according to jurisdictional regulations, site-specific requirements, and company policies and safe work procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.04.09P	clean, maintain and store access equipment	access equipment is cleaned, maintained and stored according to task, manufacturers' specifications, site-specific requirements, and company policies and safe work procedures

Range of Variables (include, but not limited to)

safety features: outriggers, jack screws, ladder ties, blocking at base of extension ladders

Knowledge

Reference Code	Learning Outcomes and Objectives
A-2.04.01L	demonstrate knowledge of access equipment, their characteristics and applications
a.	identify types of access equipment, and describe their characteristics and applications
b.	identify types of **safety features**, and describe their characteristics and applications
c.	describe operating principles of access equipment
d.	interpret information about access equipment found in manufacturers' specifications
A-2.04.02L	demonstrate knowledge of procedures to use and maintain access equipment
a.	identify workplace hazards, and describe safe work practices for using and maintaining access equipment
b.	describe procedures to erect, level and dismantle access equipment
c.	describe procedures to use access equipment
d.	describe procedures to inspect and tag worn, damaged and defective access equipment
e.	identify defects and criteria for replacement, repair or removal of access equipment
f.	describe procedures to clean, maintain and store access equipment
A-2.04.03L	demonstrate knowledge of training and certification requirements for access equipment
a.	identify training and certification requirements to use access equipment

Reference Code	Learning Outcomes and Objectives
A-2.04.04L	demonstrate knowledge of regulatory requirements for access equipment
a.	identify codes, standards and regulations for access equipment
A-2.04.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle damaged access equipment

Range of Variables (include, but not limited to)

safety features: outriggers, jack screws, ladder ties, blocking at base of extension ladders

A-2.05 Uses rigging, hoisting and lifting equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.05.01P	plan lift of materials and equipment	lift plan and **communication methods** are implemented according to job requirements and site conditions
A-2.05.02P	select rigging, hoisting and lifting equipment	rigging, hoisting and lifting equipment is selected for task according to **lifting factors**
A-2.05.03P	inspect rigging, hoisting and lifting equipment	rigging, hoisting and lifting equipment is inspected for **equipment faults** before and after each use
A-2.05.04P	remove defective rigging, hoisting and lifting equipment from service	defective rigging, hoisting and lifting equipment is removed from service according to **inspecting methods**
A-2.05.05P	identify **workplace hazards**	**workplace hazards** are identified, recorded, and hazard assessment forms are completed according to AHJ, and company policies and safe work procedures

Reference Code	Performance Criteria	Evidence of Attainment
A-2.05.06P	restrict access to lift area and path of travel	access to lift area and path of travel are restricted using barricades, signage and barrier tape according to lift plan
A-2.05.07P	rig loads	loads are rigged according to rigging procedures to ensure safety and to prevent damage to rigging equipment and material
A-2.05.08P	inspect **knots, hitches and bends** on rope	**knots, hitches and bends** on ropes are visually inspected
A-2.05.09P	attach and use tag lines	tag lines are attached and used to guide and position loads according to lift plan
A-2.05.10P	use basic hand signals	basic hand signals are used to communicate with equipment operators according to lift plan
A-2.05.11P	place load and secure in location	various **methods for securing load** without damage to personnel and property are used according to lift plan
A-2.05.12P	clean and maintain rigging, hoisting and lifting equipment	rigging, hoisting and lifting equipment is cleaned and maintained according to manufacturers' specifications
A-2.05.13P	store rigging, hoisting and lifting equipment	rigging, hoisting and lifting equipment is stored in clean, dry and secure location away from damaging conditions

Range of Variables (include, but not limited to)

communication methods: electronic communications (audible), hand signals (visual)
lifting factors: weight, loads, distance to be travelled, conditions of ground travelling on, load characteristics, environment, safety factors, weather, temperature
equipment faults: rips, tears, cracks, bird-caging, frayed wire rope, frayed synthetic slings, worn shackles, hydraulic oil leaks, missing rating tags, non-Canadian Standards Association (CSA) approved equipment
inspecting methods: tag-out procedures, site-specific procedures, consulting manufacturers' specifications, OHS regulations
workplace hazards: overhead obstructions, excavations, excessive loads, blind spots, overhead piping, live equipment, power lines, site-specific hazards, shock loading, equipment fatigue, uneven surfaces
knots, hitches and bends: bowline, cat's paw, clove hitch, timber hitch, half-hitch
methods for securing load: knots, hitches, bolting, lashing, site-specific methods

Knowledge

Reference Code	Learning Outcomes and Objectives
A-2.05.01L	demonstrate knowledge of rigging, hoisting and lifting equipment, their components, characteristics, applications and operation
a.	identify types of rigging, hoisting and lifting equipment, and describe their characteristics and applications
b.	identify **types of ropes and slings**, and describe their characteristics, safe working loads and applications
c.	describe operating principles of rigging, hoisting and lifting equipment
d.	interpret information about rigging, hoisting and lifting equipment found in manufacturers' specifications
A-2.05.02L	demonstrate knowledge of procedures to plan and perform rigging, hoisting and lifting operations
a.	describe **procedures to plan and perform lift**
A-2.05.03L	demonstrate knowledge of procedures to select, use, inspect and maintain rigging, hoisting and lifting equipment
a.	identify factors for selecting rigging, hoisting and lifting equipment
b.	describe procedures to use rigging, hoisting and lifting equipment
c.	identify **workplace hazards**, and describe safe work practices for rigging, hoisting and lifting equipment
d.	describe procedures to inspect, maintain and store rigging, hoisting and lifting equipment
e.	describe procedures used for attaching rigging, hoisting and lifting equipment to load

Reference Code	Learning Outcomes and Objectives
A-2.05.04L	demonstrate knowledge of calculations required to perform rigging, hoisting and lifting operations
a.	identify **lifting factors** to consider, and procedures to perform calculations related to rigging, hoisting and lifting operations
b.	explain how to calculate load weight
c.	explain sling angles when preparing for hoisting and lifting operation
d.	explain correlation of sling angles to sling capacities
e.	identify equipment derating criteria based on specifications and load demands
A-2.05.05L	demonstrate knowledge of **knots, bends and hitches**, their applications and procedures for tying
a.	identify types of **knots, bends and hitches** used on ropes, and describe their applications and procedures to tie them
A-2.05.06L	demonstrate knowledge of **communication methods** used for hoisting and lifting
a.	identify and interpret hand signals used for hoisting and lifting
b.	describe **communication methods** used during hoisting and lifting operations
c.	describe **procedures to ensure work area is safe** for lifting
A-2.05.07L	demonstrate knowledge of training and certification requirements to use rigging, hoisting and lifting equipment
a.	identify training and certification requirements to use rigging, hoisting and lifting equipment
A-2.05.08L	demonstrate knowledge of regulatory requirements for using rigging, hoisting and lifting equipment
a.	identify codes, standards and regulations for using rigging, hoisting and lifting equipment
A-2.05.09L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection during use of lifting equipment
b.	describe procedures to dispose of and recycle rigging, hoisting and lifting equipment

Range of Variables (include, but not limited to)

types of ropes and slings: nylon, manila, graded, wire

procedures to plan and perform lift: determine weight of load, select equipment, determine set-up of equipment, determine communication methods, set up hoisting/lifting equipment, rig material/equipment to be lifted, attach tag line, perform pre-lift checks, lift and place load, perform post-lift inspection of load, disconnect load

workplace hazards: overhead obstructions, excavations, excessive loads, blind spots, overhead piping, live equipment, power lines, site-specific hazards, shock loading, equipment fatigue, uneven surfaces

lifting factors: weight, loads, distance to be travelled, conditions of ground travelling on, load characteristics, environment, safety factors, weather, temperature

knots, hitches and bends: bowline, cat's paw, clove hitch, timber hitch, half-hitch

communication methods: electronic communications (audible), hand signals (visual)

procedures to ensure work area is safe: supervision of lift, securing work area, communication

A-2.06 Uses soldering and brazing equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-2.06.01P	obtain required permits	permits are obtained according to job specifications, and codes, standards and regulations
A-2.06.02P	select **soldering and brazing equipment**	**soldering and brazing equipment** is selected according to applications and materials
A-2.06.03P	set up **soldering and brazing equipment**	**soldering and brazing equipment** is set up according to application, materials and manufacturers' specifications
A-2.06.04P	match alloys to specific components to be soldered or brazed	alloy selected is compatible with piping material to be joined
A-2.06.05P	select solder and flux, or brazing alloy	solder and flux, or brazing alloy selected meets requirements for copper alloy joints

Reference Code	Performance Criteria	Evidence of Attainment
A-2.06.06P	join copper alloy fittings and tubing components	minimum standards for joining copper alloy are met according to codes, standards and regulations
A-2.06.07P	protect materials and equipment while soldering and brazing	materials are protected or removed from vicinity of soldering and brazing work, and equipment is protected
A-2.06.08P	maintain **soldering and brazing equipment**	**soldering and brazing equipment** is maintained according to manufacturers' specifications
A-2.06.09P	identify, tag and replace worn, damaged or defective **soldering and brazing equipment**	worn, damaged or defective **soldering and brazing equipment** is identified, tagged and replaced according to manufacturers' specifications
A-2.06.10P	store **soldering and brazing equipment** and **consumables**	**soldering and brazing equipment** and **consumables** are organized and stored to prevent damage and according to specifications

Range of Variables (include, but not limited to)

soldering and brazing equipment: oxy-fuel and air-fuel torches, gas cylinders, torch heads and tips, fire extinguisher, pressure regulators

consumables: brazing alloy and flux, soldering alloy and flux, sand cloth, gases (oxygen, acetylene, methylacetylene-propadiene propane [MAPP], propane, butane)

Knowledge

Reference Code	Learning Outcomes and Objectives
A-2.06.01L	demonstrate knowledge of **soldering and brazing equipment**, their components, characteristics, applications and operation
a.	identify types of **soldering and brazing equipment**, and describe their characteristics and applications
b.	describe operating principles of **soldering and brazing equipment**
c.	interpret information about **soldering and brazing equipment** found in manufacturers' specifications

Reference Code	Learning Outcomes and Objectives
A-2.06.02L	demonstrate knowledge of procedures to use and maintain **soldering and brazing equipment**
a.	identify workplace hazards, and describe safe work practices for **soldering and brazing equipment**
b.	identify soldering and brazing processes and applications
c.	identify soldering and brazing **consumables**
d.	describe soldering and brazing procedures
e.	describe procedures to inspect, maintain and store **soldering and brazing equipment**
A-2.06.03L	demonstrate knowledge of regulatory requirements for soldering and brazing
a.	identify codes, standards and regulations for soldering and brazing
b.	identify permits required to perform soldering and brazing
A-2.06.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle **soldering and brazing equipment**

Range of Variables (include, but not limited to)

soldering and brazing equipment: oxy-fuel and air-fuel torches, gas cylinders, torch heads and tips, fire extinguisher, pressure regulators

consumables: brazing alloy and flux, soldering alloy and flux, sand cloth, gases (oxygen, acetylene, MAPP, propane, butane)

Task A-3 Organizes work

Task Descriptor

Sprinkler fitters organize their work in order to complete their tasks safely, efficiently and effectively. They interpret codes, standards, regulations and procedures in order to ensure that fire protection systems are assembled using approved drawings and quality control practices. Sprinkler fitters use drawings and specifications to determine task, materials and methods to be used for specific installations. Drawings are also used to communicate detailed project information such as dimensions, materials used and joining methods. They use reference materials and complete documentation and reports. Sprinkler fitters participate in organizing jobs, planning job tasks and procedures, generating material lists and managing their time to meet project deadlines. They prepare the work site for fabrication, assembly and installation. Sprinkler fitters perform the layout of systems to determine locations and coordinate with other trades.

A-3.01 Interprets codes, standards, regulations and procedures

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-3.01.01P	locate and use **codes, standards and regulations** information	sections of **codes, standards and regulations** information that apply to task are located and followed
A-3.01.02P	determine requirements of **codes, standards and regulations**	requirements of **codes, standards and regulations** are determined and completed according to task
A-3.01.03P	interpret tables and charts in codes and standards	tables and charts are referred to and applied according to task
A-3.01.04P	interpret jurisdictional and environmental regulations	jurisdictional and environmental regulations are applied according to task
A-3.01.05P	interpret **specific facility procedures** and equipment procedures	**specific facility procedures** and equipment procedures are applied according to site conditions and tasks

Reference Code	Performance Criteria	Evidence of Attainment
A-3.01.06P	interpret manufacturers' installation instructions	manufacturers' installation instructions are consulted to ensure equipment is installed according to manufacturers' specifications
A-3.01.07P	adhere to **company procedures**	**company procedures** are adhered to

Range of Variables (include, but not limited to)

codes, standards and regulations: federal, provincial and municipal regulations; fire codes; fire prevention acts; building codes; insurance standards; environmental regulations; Transportation of Dangerous Goods (TDG); OHS; jurisdictional health and safety regulations; site-specific regulations; National Fire Protection Association (NFPA) codes and standards; CSA

specific facility procedures: residential, commercial, institutional, industrial, marine

company procedures: service reports, safety and communication procedures, time reporting

Knowledge

Reference Code	Learning Outcomes and Objectives
A-3.01.01L	demonstrate knowledge of regulatory requirements for sprinkler fitters
a.	identify **codes, standards and regulations** for sprinkler fitters
A-3.01.02L	demonstrate knowledge of trade-related **codes, standards, regulations**, procedures and their applications
a.	identify **types of trade-related documents**, and describe their applications
b.	explain responsibilities associated with completing and signing trade-related documents
c.	describe procedures to complete trade-related documents

Range of Variables (include, but not limited to)

codes, standards and regulations: federal, provincial and municipal regulations; fire codes; fire prevention acts; building codes; insurance standards; environmental regulations; TDG; OHS; jurisdictional health and safety regulations; site-specific regulations; NFPA codes and standards; CSA

types of trade-related documents: manufacturers' specifications; drawings, addendums; project specifications; codes, standards and regulations; change orders; building and safety permits; technical bulletins; manuals; SDS; safety logs; time sheets; OHS reports; contractors' material and test certificates; commissioning documents; equipment operating certificates; as-builts

A-3.02 Uses drawings and specifications

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-3.02.01P	interpret engineers' **specifications**	engineers' **specifications** are interpreted to determine required equipment and components
A-3.02.02P	interpret **drawings**	**drawings** are interpreted to identify **specifications** and locations of components and to obtain information on fire protection systems and **possible obstructions**
A-3.02.03P	scale **drawings**	**drawings** are scaled to determine installation requirements and approximate location and dimensions of fire protection and other equipment
A-3.02.04P	create **on-site drawings**	**on-site drawings** are created to coordinate work and document work performed

Range of Variables (include, but not limited to)

specifications: size, type of material, manufacturers', manufacturers' installation procedures

drawings: spool sheets, schematic, site service, isometric, orthographic, 3-D, digital or paper, architectural, mechanical, structural, electrical, shop

possible obstructions: fixtures, piping, ductwork, ceiling construction (beams, purlins, bulkheads, overhead walkways), garage doors

on-site drawings: sketches, markups, as-builts

Knowledge

Reference Code	Learning Outcomes and Objectives
A-3.02.01L	demonstrate knowledge of **drawings** and **on-site drawings**
a.	identify **drawings** and **on-site drawings**, and describe their characteristics and applications
b.	define elements of reading and sketching **drawings**
A-3.02.02L	demonstrate knowledge of procedures to read and interpret **drawings** and **on-site drawings**
a.	explain fundamentals of orthographic and isometric projections
b.	identify **types of lines** found on **drawings**
c.	identify symbols found on **drawings**
d.	identify **types of views** found on **drawings**
e.	describe procedures to interpret dimensions on **drawings**
f.	identify **types of scales**, and describe their characteristics and applications
g.	identify drafting tools and drawing equipment and computer-aided design, and describe their applications
h.	describe procedures to interpret **drawings** in both metric and imperial units
A-3.02.03L	demonstrate knowledge of procedures to draw and label orthographic and isometric drawings
a.	describe procedures to prepare and create orthographic and isometric drawings
A-3.02.04L	demonstrate knowledge of procedures to read and interpret information about fire protection found in **drawings**
a.	identify **divisions of drawings** and describe their purpose
b.	identify **divisions of specifications** and describe their purpose
c.	identify views and **drawings** of a building and describe their purpose
d.	interpret fire protection information found on **drawings**
e.	describe procedures to interpret and convert metric and imperial scaling

Range of Variables (include, but not limited to)

drawings: spool sheets, schematic, site service, isometric, orthographic, 3-D, digital or paper, architectural, mechanical, structural, electrical, shop

on-site drawings: sketches, markups, as-builts

types of lines: object (visible), hidden, centre, dimension, extension, section cutting, material section

types of views: plan, elevation, sections, details, site, plot, survey

types of scales: metric scale (SI), architect scale (imperial), engineer scales

divisions of drawings: architectural, structural, mechanical, electrical, site service, landscaping, specifications, schedules

divisions of specifications: heating, ventilation and air conditioning (HVAC); architectural; structural; electrical; fire suppression; plumbing

A-3.03 Uses documentation and reference material

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-3.03.01P	interpret technical bulletins and manuals	technical bulletins and manuals are interpreted to obtain detailed information about fire protection equipment and components
A-3.03.02P	submit as-built drawings	as-built drawings that indicate modifications to original plans are submitted according to job specifications
A-3.03.03P	maintain, complete and submit **documents** and **reports**	**documents** and **reports** are maintained, completed and submitted according to contract requirements, job progress, AHJ, and codes, standards and regulations
A-3.03.04P	interpret and follow change orders (addendum) and site instructions	change orders (addendum) and site instructions are interpreted and followed according to contract requirements and job progress

Range of Variables (include, but not limited to)

documents: service requests, work orders, on-site change notices, accident and incident reports, hot work permits, time sheets, electronic and paper, FLRA, PSI, lift plans, HA, equipment and PPE inspections, toolbox talk, safety meeting minutes, WHMIS (GHS) documents

reports: inspection reports, material and test sheets, progress reports, time and material reports, verification reports, deficiency lists, company-specific reports

Knowledge

Reference Code	Learning Outcomes and Objectives
A-3.03.01L	demonstrate knowledge of trade-related **documents**, **reports** and reference materials, and their applications
a.	identify **types of trade-related documents, reports and reference materials**, and describe their applications
b.	explain responsibilities associated with completing and signing trade-related **documents** and **reports**
c.	describe procedures to complete trade-related **documents** and **reports**
A-3.03.02L	demonstrate knowledge of regulatory requirements for documentation
a.	identify codes, standards and regulations for documentation

Range of Variables (include, but not limited to)

documents: service requests, work orders, on-site change notices, accident and incident reports, hot work permits, time sheets, electronic and paper, FLRA, PSI, lift plans, HA, equipment and PPE inspections, toolbox talk, safety meeting minutes, WHMIS (GHS) documents

reports: inspection, material and test sheets, progress reports, time and material reports, verification reports, deficiency lists, company-specific reports

types of trade-related documents, reports and reference material: manufacturers' specifications; drawings; addendums; specifications; codes, standards and regulations; work orders; building and safety permits; technical bulletins; manuals; SDS; safety logs; time sheets; OHS reports; contractors' material and test certificates; commissioning papers; equipment operating certificates; deficiency lists

A-3.04 Plans job tasks and procedures

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-3.04.01P	prepare material list	material list is prepared for ordering material and confirming availability
A-3.04.02P	schedule delivery	delivery of equipment and materials is scheduled according to job progress
A-3.04.03P	arrange for storage	materials are stored in safe and secure lay down location until required for task according to job progress
A-3.04.04P	manage schedule	schedule is managed to arrange access to work site, avoid down time and delays, and maximize efficiency on the job
A-3.04.05P	estimate labour and material requirements to complete tasks	labour and material estimates take **factors** into consideration
A-3.04.06P	verify required permits are in place before commencing work	required documentation is filed according to task requirements, AHJ and regulations
A-3.04.07P	perform hazard assessments	hazard assessments are completed according to safe work practices and procedures
A-3.04.08P	coordinate tasks with other **tradespeople**	tasks with other **tradespeople** are coordinated to avoid job conflicts
A-3.04.09P	assign personnel to specific locations and tasks	personnel are assigned to specific locations and tasks according to job requirements
A-3.04.10P	arrange for use of **specialized tools and equipment**	use of **specialized tools and equipment** is arranged according to task
A-3.04.11P	organize tools and equipment usage	tools and equipment usage is organized according to task

Range of Variables (include, but not limited to)

factors: tools and equipment, schedule, deadlines, expertise, movement of material and equipment, weather conditions, ceiling height, site access, personnel, materials, permits, location

tradespeople: crane operators, carpenters, plumbers, electricians, sheet metal workers, steamfitter/pipefitters, drywallers, painters, mill workers

specialized tools and equipment: cranes, power-elevated work platforms, coring machines, X-ray scanners, diesel generators, come-alongs

Knowledge

Reference Code	Learning Outcomes and Objectives
A-3.04.01L	demonstrate knowledge of procedures to plan and organize jobs
a.	identify **sources of information** relevant to job planning
b.	identify **factors** to consider for determining job requirements
c.	describe procedures to **plan job tasks**
d.	describe procedures to receive and verify delivered materials
e.	describe procedures to store, organize and maintain inventory
f.	identify **factors that affect material take-off lists**, and describe their applications and procedures to produce them
A-3.04.02L	demonstrate knowledge of regulatory requirements for planning and organizing jobs
a.	identify codes, standards and regulations for planning and organizing jobs
A-3.04.03L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	identify materials that can be reconditioned, reused or recycled

Range of Variables (include, but not limited to)

sources of information: documentation; drawings; related professionals; clients; codes, standards and regulations

factors: tools and equipment, schedule, deadlines, expertise, movement of material and equipment, weather conditions, ceiling height, site access, personnel, materials, permits, location

plan job tasks: scheduling, estimating, coordinating site access, fabrication sheets

factors that affect material take-off lists: material estimation, material installation, job specifications

A-3.05 Prepares work site

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-3.05.01P	receive, inspect and verify delivered material	delivered material is received, inspected and verified using packing slips, serial numbers and model numbers to detect shipping damage, and confirm quantities and back orders
A-3.05.02P	check or apply labels on **hazardous materials and supplies**	labels on **hazardous materials and supplies** are checked or applied according to codes, standards and regulations
A-3.05.03P	secure **materials and supplies**	**materials and supplies** are secured to prevent damage and injury
A-3.05.04P	select and use **moving equipment**	**moving equipment** is selected and used to move materials according to task
A-3.05.05P	store **materials and supplies**	**materials and supplies** are stored at appropriate temperature and location to prevent deterioration or damage
A-3.05.06P	set up fabrication tools and equipment in close proximity	fabrication tools and equipment are set up in close proximity to work being performed taking into consideration other trades
A-3.05.07P	locate washrooms, **site safety equipment**, emergency exits and muster points	location of washrooms, **site safety equipment**, emergency exits and muster points are located on-site
A-3.05.08P	locate **service and isolation points**	**service and isolation points** are located

Range of Variables (include, but not limited to)

hazardous materials and supplies: cutting oils, fuel containers, fire extinguishers, antifreeze, solvent cement, pressurized gas cylinders, flux, solder

materials and supplies: sprinklers, solvent cement, pressurized gas cylinders, chlorinated polyvinyl chloride (CPVC) pipe and fittings

moving equipment: forklifts, power jacks, hand carts

site safety equipment: fire extinguishers, eye-wash stations, first-aid kits, spill kits, air-monitoring devices

service and isolation points: water, electricity

Knowledge

Reference Code	Learning Outcomes and Objectives
A-3.05.01L	demonstrate knowledge of procedures to receive materials and verify back orders
a.	describe procedures to receive and verify delivered materials
b.	identify **moving equipment** used to move materials
A-3.05.02L	demonstrate knowledge of procedures to store, secure, organize and maintain materials
a.	identify workplace hazards, and describe safe work practices to store, secure, organize and maintain materials
b.	identify **hazardous materials and supplies**, and describe safe work practices to handle, store, secure, transport and dispose of them
c.	describe procedures to store, secure, organize and maintain inventory
A-3.05.03L	demonstrate knowledge of **procedures to plan for and prepare work sites**
a.	describe procedures to prepare work sites
b.	identify location and types of **site safety equipment**
c.	describe procedures to set up fabrication tools and equipment
d.	describe procedures to locate **service and isolation points**
A-3.05.04L	demonstrate knowledge of regulatory requirements for preparing work sites
a.	identify codes, standards and regulations for preparing work sites
A-3.05.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle materials

Range of Variables (include, but not limited to)

moving equipment: forklifts, power jacks, hand carts
hazardous materials and supplies: cutting oils, fuel containers, fire extinguishers, antifreeze, solvent cement, pressurized gas cylinders, flux, solder
procedures to plan for and prepare work sites: lay down, erecting barricades and flagging, identifying hazards, locating service and isolation points, material take-off lists
site safety equipment: fire extinguishers, eye-wash stations, first-aid kits, spill kits, air-monitoring devices
service and isolation points: water, electricity

A-3.06 Performs layout of systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-3.06.01P	determine number, type and location of sprinklers	number, type and location of sprinklers are determined according to **design factors**
A-3.06.02P	determine location of **mains** and branch lines	**mains** and branch lines locations are determined according to site conditions and drawings
A-3.06.03P	determine hanging, bracing and support locations	hanging, bracing and support locations are determined to ensure system piping is installed consistently according to drawings, site conditions, and codes, standards and regulations
A-3.06.04P	determine location of penetrations	location of penetrations is identified according to drawings and site conditions
A-3.06.05P	confirm information on **drawings**	information on **drawings** is confirmed according to site conditions
A-3.06.06P	modify layout to accommodate **site conditions**	layout is modified according to codes, standards and regulations to accommodate **site conditions**

Range of Variables (include, but not limited to)

design factors: occupancy hazard classification, building classification, ceiling structure, type of system and sprinklers, obstructions

mains: feed, cross

drawings: isometric, orthographic, 3-D, spool

site conditions: ducts, structural members, lighting, obstructions

Knowledge

Reference Code	Learning Outcomes and Objectives
A-3.06.01L	demonstrate knowledge of **systems**, their **components**, characteristics, applications and operation
a.	identify **systems** and **components**, and describe their characteristics and applications
b.	describe operating principles of **systems** and their **components**
c.	interpret information about **systems** and their **components** found on **drawings** and specifications
A-3.06.02L	demonstrate knowledge of procedures to lay out **systems** and their **components**
a.	identify tools and equipment used to lay out **systems** and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for **system** and **component** layout
c.	describe procedures to lay out **systems** and their **components**
d.	identify **site conditions** and **design factors** affecting layout
A-3.06.03L	demonstrate knowledge of regulatory requirements to lay out **systems** and **components**
a.	identify codes, standards and regulations for **systems** and **components** lay out

Range of Variables (include, but not limited to)

systems: wet pipe, antifreeze, dry pipe, preaction/deluge, standpipe and hose, water mist, foam, CO_2, clean agent

components: feed mains, valves, pumps, cross mains, branch lines, risers, test connections, fittings, drains, tanks, sprinklers, nozzles, hangers, bracing, supports, electrical appurtenances

drawings: isometric, orthographic, 3-D, spool

site conditions: ducts, structural members, lighting, obstructions

design factors: occupancy hazard classification, building classification, ceiling structure, type of system and sprinklers, obstructions

Task A-4 Commissions systems

Task Descriptor

Commissioning is the final step in installing water supply, fire protection and fire suppression systems. It involves verification and testing of the systems and their components to ensure they operate within design parameters, and meet all applicable codes, standards, regulations and AHJ requirements.

A-4.01 Commissions water supply systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-4.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
A-4.01.02P	perform acceptance **tests** of water supply and **components**	acceptance **tests** of water supply system and **components** are performed to verify operation and performance of water supply system according to Contractor's Material and Test Certificate for Underground Piping, and codes, standards and regulations
A-4.01.03P	perform acceptance test of fire pump system	acceptance test of fire pump system is performed with manufacturer's representative to verify operation and performance of pump assembly according to codes, standards and regulations
A-4.01.04P	verify operation of water supply system **components**	water supply system **components** are operating according to system requirements and meet minimum system design performance and criteria

Reference Code	Performance Criteria	Evidence of Attainment
A-4.01.05P	arrange for AHJ to confirm that water supply systems and their **components** are in compliance	AHJ has confirmed that water supply systems and their **components** are in compliance with manufacturers' specifications, and codes, standards and regulations
A-4.01.06P	complete documentation	documentation has been completed according to company policies, AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

tests: hydrostatic, flushing, acceptance test (commissioning) of fire pump, component operation (cross-connection control assemblies, water tanks, reservoirs)

components: cross-connection control assemblies, water tanks, reservoirs, fire pumps, underground piping, strainers, control valves, hydrants, thrust blocks and restraints

Knowledge

Reference Code	Learning Outcomes and Objectives
A-4.01.01L	demonstrate knowledge of water supply systems, their **components**, characteristics, applications and operation
a.	identify water supply systems and **components**, and describe their characteristics and applications
b.	describe operating principles of water supply systems and their **components**
c.	interpret information about water supply systems and their **components** found on drawings and specifications
A-4.01.02L	demonstrate knowledge of procedures to commission water supply systems
a.	identify workplace hazards, and describe safe work practices for commissioning of water supply systems
b.	describe procedures to commission water supply systems
c.	identify **tests** to be performed on water supply systems
d.	calculate flow rates and discharge pressures
A-4.01.03L	demonstrate knowledge of regulatory requirements for commissioning of water supply systems
a.	identify codes, standards and regulations for commissioning of water supply systems

Reference Code	Learning Outcomes and Objectives
A-4.01.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that mitigate and control water discharge during commissioning

Range of Variables (include, but not limited to)

components: cross-connection control assemblies, water tanks, reservoirs, fire pumps, underground piping, strainers, control valves, hydrants, thrust blocks and restraints

tests: hydrostatic, flushing, acceptance test (commissioning) of fire pump, component operation (cross-connection control assemblies, water tanks, reservoirs)

A-4.02 Commissions water-based fire protection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-4.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
A-4.02.02P	perform **pressure tests** on piping system	**pressure tests** are performed on piping and components of piping system according to Contractor's Material and Test Certificate for Aboveground Piping, and codes, standards and regulations
A-4.02.03P	perform **pressure tests** on detection systems	**pressure tests** are performed on detection components according to manufacturers' specifications, AHJ, and codes, standards and regulations
A-4.02.04P	perform operational tests of system	tests are performed to verify operation of system according to Contractor's Material and Test Certificate, manufacturers' specifications, AHJ, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
A-4.02.05P	perform forward flow test of cross-connection control assemblies	forward flow test of cross-connection control assemblies is performed according to Contractor's Material and Test Certificate
A-4.02.06P	inspect seal of pipe penetrations	seal of pipe penetrations is inspected on floors, walls and ceilings to ensure fire rating, weatherproofing and compatibility according to manufacturers' specifications and AHJ
A-4.02.07P	verify placement of hangers, supports, restraints and bracing	placement of hangers, supports, restraints and bracing are checked by inspecting and referring to project specifications, and codes, standards and regulations
A-4.02.08P	check pitch and elevation of piping system	pitch and elevation of piping system is checked according to site-specific requirements, and codes, standards and regulations
A-4.02.09P	ensure that piping, **components** and devices are protected	piping, **components** and devices are protected against environmental conditions (interior and exterior)
A-4.02.10P	verify that **foreign material** is removed	**foreign material** has been removed by performing **pipe preparation**
A-4.02.11P	ensure pipe, systems and **components** are labelled	pipe, systems and **components** are labelled according to site specifications, and codes, standards and regulations
A-4.02.12P	ensure that testing blanks and testing caps are removed	testing blanks and testing caps are removed to allow for system operation according to codes, standards and regulations
A-4.02.13P	verify operation of **control valves**	full range of operation of **control valves** is verified
A-4.02.14P	verify fire protection system **components**	**components** are verified to confirm their performance meets design criteria
A-4.02.15P	verify that escutcheons and guards are in place	escutcheons and guards are in place and sprinkler protectors are removed

Reference Code	Performance Criteria	Evidence of Attainment
A-4.02.16P	test operation of **detection devices**	operation of **detection devices** is tested according to codes, standards and regulations
A-4.02.17P	verify positioning of **protection devices**	positioning of **protection devices** is verified to ensure proper coverage is achieved
A-4.02.18P	verify operation of **signal initiating devices**	operation of **signal initiating devices** meets accepted parameters
A-4.02.19P	ensure that **documentation** is completed	**documentation** is completed and submitted according to project specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

pressure tests: hydrostatic, pneumatic

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents, emergency and manual pull stations

foreign material: cut-out discs, oil and welding slag, sediment, rocks, vermin

pipe preparation: flushing (hydraulic or pneumatic), swabbing

control valves: post indicator valves (PIVs), gear-operated ball valves, butterfly valves, outside stem & yoke (OS&Y) valves

detection devices: heat-actuated devices (HADs), air sampling devices, linear heat detectors, smoke detectors, infrared and ultraviolet detectors

protection devices: sprinklers, nozzles

signal-initiating devices: flow, pressure, supervisory/tamper switches

documentation: commissioning reports, as-built drawings, system component instructions for care and maintenance, NFPA 25 standard, AHJ requirements, Contractor's Material and Test Certificate for Aboveground Piping

Knowledge

Reference Code	Learning Outcomes and Objectives
A-4.02.01L	demonstrate knowledge of water-based fire protection systems, their **components**, characteristics, applications and operation
a.	identify water-based fire protection systems and **components**, and describe their characteristics and applications
b.	describe operating principles of water-based fire protection systems
c.	interpret information about commissioning of water-based fire protection systems found on drawings and specifications
A-4.02.02L	demonstrate knowledge of procedures to commission water-based fire protection systems
a.	identify tools and equipment used to commission water-based fire protection systems, and describe their procedures for use
b.	identify safety hazards, and describe safe work practices for commissioning water-based fire protection systems
c.	describe procedures to commission water-based fire protection systems
d.	identify **acceptance tests and verifications** to be performed on water-based fire protection systems
A-4.02.03L	demonstrate knowledge of regulatory requirements for commissioning water-based fire protection systems
a.	interpret codes, standards and regulations for commissioning water-based fire protection systems
A-4.02.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify **practices that contribute to environmental protection** during commissioning procedures

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents, emergency and manual pull stations

acceptance tests and verifications: pressure (hydrostatic, pneumatic), operation, trip, seal of penetrations, placement of hangers and bracing, pitch and elevation, flushing and swabbing, labelling, blank testing gaskets, escutcheons, forward flow

practices that contribute to environmental protection: de-chlorination of discharged water used for testing, disposal of fire protection materials

A-4.03 Commissions specialty fire suppression systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-4.03.01P	select and use tools and equipment	tools and equipment are selected and used according to task
A-4.03.02P	verify detection release system	detection release system is verified according to manufacturers' specifications, and codes, standards and regulations
A-4.03.03P	arrange for AHJ to confirm placement of hangers, supports, restraints and bracing	hangers, supports, restraints and bracing placement is confirmed by AHJ
A-4.03.04P	ensure that piping, **components** and devices are protected	piping, **components** and devices are protected against environmental conditions (interior and exterior)
A-4.03.05P	perform **pressure tests** on specialty fire suppression systems	**pressure tests** are performed on specialty fire suppression systems according to codes, standards and regulations
A-4.03.06P	ensure pipe, systems and **components** are labelled	pipe, systems and **components** are labelled according to site specifications, and codes, standards and regulations
A-4.03.07P	verify fire suppression system **components**	**components** are verified to confirm their performance meets design criteria
A-4.03.08P	test and verify operation of **detection devices**	operation of **detection devices** is tested and verified according to AHJ-prescribed standards
A-4.03.09P	verify positioning of nozzles	positioning of nozzles is verified to ensure proper placement is achieved
A-4.03.10P	verify operation of **signal initiating devices**	operation of **signal initiating devices** meets accepted parameters

Reference Code	Performance Criteria	Evidence of Attainment
A-4.03.11P	ensure that **documentation** is completed	**documentation** is completed and submitted according to project specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switch

pressure tests: hydrostatic, pneumatic

detection devices: HADs, air sampling devices, linear heat detectors, smoke detectors, infrared and ultraviolet detectors

signal-initiating devices: alarm flow pressure switch, tampers, solenoids, electrical actuators, releasing control panel's

documentation: commissioning reports, as-built drawings, instruction and maintenance manual including full sequence of operation

Knowledge

Reference Code	Learning Outcomes and Objectives
A-4.03.01L	demonstrate knowledge of specialty fire suppression systems, their **components**, characteristics, applications and operation
a.	identify specialty fire suppression systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of specialty fire suppression systems
c.	interpret information about commissioning of specialty fire suppression systems found on drawings and specifications
A-4.03.02L	demonstrate knowledge of procedures to commission specialty fire suppression systems
a.	identify tools and equipment used to commission specialty fire suppression systems, and describe their procedures for use
b.	identify safety hazards, and describe safe work practices for commissioning specialty fire suppression systems
c.	describe procedures to commission specialty fire suppression systems

Reference Code	Learning Outcomes and Objectives
A-4.03.03L	demonstrate knowledge of testing specialty fire suppression systems
a.	describe procedures to test specialty fire suppression systems
b.	identify requirements of acceptance testing of specialty fire suppression systems
A-4.03.04L	demonstrate knowledge of regulatory requirements for commissioning specialty fire suppression systems
a.	interpret codes, standards and regulations for commissioning specialty fire suppression systems
b.	explain liabilities and responsibilities for testing specialty fire suppression systems

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switch

Task A-5 Maintains continuous learning

Task Descriptor

Sprinkler fitters must stay current on building science principles; sustainable and emerging technologies being introduced in the trade. They need to keep informed about new and changing codes and regulations, new types of equipment, materials, processes, procedures and techniques to work safely and more efficiently and increase quality and productivity.

A-5.01 Upgrades in new trade practices and procedures

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-5.01.01P	apply continuous learning methods	continuous learning methods are applied

Reference Code	Performance Criteria	Evidence of Attainment
A-5.01.02P	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-5.01.03P	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, trade shows, language supports, accommodations

Knowledge

Reference Code	Learning Outcomes and Objectives
A-5.01.01L	demonstrate knowledge of upgrading in new trade practices and procedures
a.	identify **continuous learning methods**
b.	explain importance of staying current on new trade practices and procedures
c.	identify **supports and resources** for learning
A-5.01.02L	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, trainings, 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, trade shows, language supports, accommodations

elements of a professional portfolio: résumé, certificates, licenses, diplomas, degrees, transcripts, marketable skills, professional accomplishments, work samples, awards, references

factors: new technology, sector trends and practices, skills updating, legislative and regulatory changes, barriers to learning

A-5.02 Upgrades in emerging technologies

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-5.02.01P	read **information** about latest advancements and **emerging technologies**	**information** about latest advancements and **emerging technologies** is read to stay informed
A-5.02.02P	attend seminars, webinars and information sessions	seminars, webinars and information sessions organized by manufacturers, suppliers, unions and employers are attended
A-5.02.03P	share **information** on **emerging technologies** with colleagues and management	**information** on **emerging technologies** 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
emerging technologies: Robotic Total Stations, BIM, laser scanning, remote inspection software, digital document management systems

Knowledge

Reference Code	Learning Outcomes and Objectives
A-5.02.01L	demonstrate knowledge of upgrading in **emerging technologies**
a.	identify types of **information** on **emerging technologies**
b.	describe importance of staying current on **emerging technologies**
c.	explain use of **emerging technologies**
d.	list **emerging technologies** for specific tasks
e.	determine **emerging technologies** for work site tasks

Range of Variables (include, but not limited to)

emerging technologies: Robotic Total Stations, BIM, laser scanning, remote inspection software, digital document management systems
information: manufacturers' literature, online resources, trade journals and magazines

Task A-6 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-6.01 Uses communication techniques

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-6.01.01P	demonstrate communication techniques with individuals or in a group	instructions and messages are interpreted by all parties involved in communication
A-6.01.02P	listen using **active listening** techniques	**active listening** techniques are utilized
A-6.01.03P	speak clearly using correct industry terminology to ensure understanding	understanding of message is confirmed by both parties
A-6.01.04P	receive and respond to instructions	response to instructions indicates understanding
A-6.01.05P	receive and respond to feedback on work completed or performed	response to feedback indicates understanding and corrective measures are taken
A-6.01.06P	explain and provide feedback	explanation and feedback is provided, and task is carried out as directed
A-6.01.07P	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-6.01.08P	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-6.01.09P	participate in safety and information meetings	meetings are attended, information is relayed to employees, and is applied
A-6.01.10P	send and receive **electronic messages**	**electronic messages** are sent and received using professionalism, plain language and clear statements according to company policies and procedures
A-6.01.11P	use **online tools**	**online tools** are used to communicate

Range of Variables (include, but not limited to)

active listening: hearing, interpreting, reflecting, responding, paraphrasing
electronic messages: email, text messages
online tools: video conferencing, teleconferencing, apps

Knowledge

Reference Code	Learning Outcomes and Objectives
A-6.01.01L	demonstrate knowledge of trade terminology
a.	define terminology used in trade
A-6.01.02L	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** used to effectively communicate
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** and **online tools**

Range of Variables (include, but not limited to)

people in the workplace: engineers, designers, other tradespeople, colleagues, apprentices, supervisors, clients, jurisdictional representatives, manufacturers, office administrators

sources of information: regulations, codes, occupational health and safety requirements, jurisdictional requirements, prints, drawings, specifications, company and client documentation

learning styles: visual, auditory, read/write, 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

electronic messages: email, text messages

online tools: video conferencing, teleconferencing, apps

A-6.02 Uses mentoring techniques

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
A-6.02.01P	identify and communicate learning objectives and point of lesson	apprentice or learner can explain objectives and point of lesson
A-6.02.02P	link lesson to other lessons and project	sequence of lessons are defined and unplanned learning opportunities are identified
A-6.02.03P	demonstrate performance of a skill to an apprentice or learner	**steps required to demonstrate a skill** are performed
A-6.02.04P	set up conditions required for apprentice or learner to practise a skill	**practise conditions** are set up so that skill can be practised safely by apprentice or learner
A-6.02.05P	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

Reference Code	Performance Criteria	Evidence of Attainment
A-6.02.06P	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-6.02.07P	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
A-6.02.08P	give supportive and constructive feedback	apprentice or learner adopts best practices after receiving supportive or constructive feedback
A-6.02.09P	support apprentice or learner in pursuing technical training opportunities	technical training is completed within time frame prescribed by apprenticeship authority
A-6.02.10P	support anti-**harassment** and anti-**discrimination** practices in workplace	workplace is **harassment** and **discrimination**-free
A-6.02.11P	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-6.02.12P	assess apprentice or learner suitability to trade during probationary period	apprentice or learner is given constructive feedback that helps them identify their 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

practise conditions: guided, limited independence, full independence

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 and Objectives
A-6.02.01L	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-6.02.02L	demonstrate knowledge of strategies for teaching workplace skills
a.	identify different roles played by workplace mentor
b.	explain importance of identifying point of lessons
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): adaptability, collaboration, communication, creativity and innovation, digital, numeracy, problem solving, reading, writing

learning styles: visual, auditory, read/write, 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 positive feedback, practising through repetition, listening

Major Work Activity B—Installs water supply

Task B-7 Installs underground water supplies

Task Descriptor

Sprinkler fitters install and connect underground piping and components from a predetermined water source to provide a reliable and adequate water supply to fire protection systems. While trenching and backfilling are performed by other trades, sprinkler fitters are involved in supervising this work. After installation of piping and components, they also must flush system to remove debris that can interfere with the operation of the fire protection system.

B-7.01 Supervises trenching and backfilling

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-7.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-7.01.02P	lay out location for trench	location for trench is laid out to ensure accessibility for machinery, material and workers
B-7.01.03P	verify location of underground/overhead **utilities**	location of underground/overhead **utilities** is verified to prevent injury and disruption of service
B-7.01.04P	coordinate tie-ins with AHJ and municipal waterworks	tie-ins are coordinated with AHJ and municipal waterworks to avoid or minimize disruptions to water supply
B-7.01.05P	inspect trench	trench is inspected for adequate size and depth according to OHS and AHJ
B-7.01.06P	coordinate laydowns	laydowns for debris, backfill and installation material and tools are coordinated according to task

Reference Code	Performance Criteria	Evidence of Attainment
B-7.01.07P	select **backfill material**	**backfill material** is selected according to codes, standards and regulations
B-7.01.08P	ensure safe access to trench	safe access to trench is ensured for installation of underground materials
B-7.01.09P	verify backfill compaction	backfill compaction is verified according to site requirements and specifications

Range of Variables (include, but not limited to)

utilities: water, gas, power, sewage, data and telecommunications
backfill material: sand, screened gravel, native fill

Knowledge

Reference Code	Learning Outcomes and Objectives
B-7.01.01L	demonstrate knowledge of safety procedures and requirements for trenching and backfilling
a.	interpret information about trenching and backfilling found on drawings and specifications
B-7.01.02L	demonstrate knowledge of procedures and requirements for trenching and backfilling
a.	identify tools, equipment and PPE related to trenching and backfilling
b.	identify workplace hazards, and describe safe work practices for trenching and backfilling
c.	describe procedures for trenching and backfilling
d.	describe site conditions that affect trenching and backfilling
e.	describe shoring and piping requirements
f.	describe laydowns and spoil piles for debris, **backfill material** and installation material
g.	identify types of access equipment related to trenching and backfilling
h.	identify types of **backfill material**, and describe their characteristics and applications
i.	describe procedures to inspect trenches

Reference Code	Learning Outcomes and Objectives
B-7.01.03L	demonstrate knowledge of communication practices for trenching and backfilling
a.	describe audible/visual procedures for communicating during trenching and backfilling
B-7.01.04L	demonstrate knowledge of training and certification requirements for trenching and backfilling
a.	identify training and certification requirements for workers performing trenching and backfilling
B-7.01.05L	demonstrate knowledge of regulatory requirements for trenching and backfilling
a.	identify codes, standards and regulations, and AHJ requirements related to trenching and backfilling
b.	identify OHS requirements related to trenching and backfilling
B-7.01.06L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle spoil waste

Range of Variables (include, but not limited to)

backfill material: sand, screened gravel, native fill

B-7.02 Installs underground piping and components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-7.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-7.02.02P	identify type and class of piping material and fittings	type and class of piping material and fittings are identified according to **ground conditions**, AHJ, drawings, specifications, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
B-7.02.03P	assemble pipe and fittings	pipe and fittings are assembled using **joining methods** according to specifications, and codes, standards and regulations
B-7.02.04P	restrain pipe and fittings	pipe and fittings are restrained with **anchoring systems** to provide stability, prevent pipe movement and separation, and protect against damage according to manufacturers' specifications, and codes, standards and regulations
B-7.02.05P	apply **protective material**	**protective material** is applied below and above pipe to prevent damage from **foreign objects**
B-7.02.06P	attach **components**	**components** are attached to piping to allow control and isolation of fire water system
B-7.02.07P	install **components** within chambers and underground pits	**components** are installed within chambers and underground pits according to standards to ensure accessibility
B-7.02.08P	connect piping to water source	piping is connected to water source with **devices** to ensure adequate water supply to fire protection system
B-7.02.09P	place tracer wire and warning tape	tracer wire and warning tape is placed in trench on or above the pipe according to municipal requirements, site conditions and industry practices
B-7.02.10P	ensure **cathodic/corrosion protection**	**cathodic/corrosion protection** meets manufacturers' specifications and AHJ
B-7.02.11P	allow for clearances and tolerances	clearances and tolerances between piping and **surrounding environment** are allowed for to prevent damage caused by excessive stress loads

Reference Code	Performance Criteria	Evidence of Attainment
B-7.02.12P	seal pipe penetrations	pipe penetrations through **structures** are sealed to maintain impermeability and flexibility of **structure** using various **materials**
B-7.02.13P	terminate and cap pipe	pipe is terminated and capped in selected location inside building, ensuring its accessibility
B-7.02.14P	install testing connection to water termination point and fire hydrants	testing connection is installed to water termination point and fire hydrants to allow for flushing, testing and chlorination according to AHJ, and codes, standards and regulations
B-7.02.15P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

ground conditions: acidity, moisture content, soil properties (sandy, rocky), compaction density, local conditions

joining methods: bell and spigot, flange with gasket, mechanical, fusion welding, solvent cementing, grooved

anchoring systems: thrust blocks, rodding, anchors, clamps

protective material: sand, screened gravel

foreign objects: rocks, roots, debris

components: gate valves, PIVs, water monitor assembly, fire hydrants, backflow preventers

devices: tapping valves, underground tees

cathodic/corrosion protection: sacrificial anodes, petroleum-based tape, plastic wrap

surrounding environment: under structures, railroad tracks, roadways and stockpiles; through concrete and timber structures

structures: walls, foundations, floors

materials: cement, caulking, flexible mastic, flexible assembly

Knowledge

Reference Code	Learning Outcomes and Objectives
B-7.02.01L	demonstrate knowledge of underground piping and **components**, characteristics, applications and operation
a.	identify underground piping and **components**, and describe their characteristics and applications
b.	describe operating principles of underground piping and **components**
c.	interpret information about underground piping and **components** found on drawings and specifications
B-7.02.02L	demonstrate knowledge of clearances and tolerances
a.	identify where clearances and tolerances should be taken into consideration
B-7.02.03L	demonstrate knowledge of water source connections
a.	identify types of public water sources and their connection requirements
b.	identify location of water source connection
B-7.02.04L	demonstrate knowledge of procedures to install underground piping and their **components**
a.	identify tools and equipment used to install underground piping and **components**, and describe their procedures for use
b.	identify work site hazards, and describe safe work practices for underground piping and **components**
c.	describe procedures to install underground piping and **components**
B-7.02.05L	demonstrate knowledge of regulatory requirements for underground piping and **components**
a.	identify codes, standards and regulations for underground piping and **components**
B-7.02.06L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle underground piping and **components**

Range of Variables (include, but not limited to)

components: gate valves, PIVs, water monitor assembly, fire hydrants, backflow preventers

B-7.03 Flushes underground system

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-7.03.01P	select and use **tools and equipment**	**tools and equipment** are selected and used according to task
B-7.03.02P	select and install flanges, fittings and valves	flanges, fittings and valves are selected and installed on underground connection inside building to allow for required flow
B-7.03.03P	ensure underground control valve is open	underground control valve is open at water source to pressurize system
B-7.03.04P	connect hoses to flushing connections	hoses are connected to flushing connections at determined points and water is directed to safe location
B-7.03.05P	discharge water flow	water flow is discharged from flushing connections allowing predetermined flow requirements and according to environmental considerations
B-7.03.06P	complete documentation	documentation is completed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

tools and equipment: pitot tube, Y-isolation valves, fire hoses, fire hydrant wrenches, diffusers, burlap sack with tie wires

Knowledge

Reference Code	Learning Outcomes and Objectives
B-7.03.01L	demonstrate knowledge of underground piping and components, characteristics, applications and operation
a.	identify underground piping and components, and describe their characteristics and applications
b.	describe operating principles of underground piping and components
c.	interpret information about underground piping and components found on drawings and specifications
B-7.03.02L	demonstrate knowledge of procedures to flush underground systems
a.	identify **tools and equipment** used to flush underground systems, and describe their procedures for use
b.	identify work site hazards, and describe safe work practices for flushing underground systems
c.	describe procedures to flush underground systems
d.	identify required flow rates for flushing of underground systems
B-7.03.03L	demonstrate knowledge of regulatory requirements for flushing of underground systems
a.	identify codes, standards and regulations for flushing of underground systems
B-7.03.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify environmentally sound practices to discharge treated water

Range of Variables (include, but not limited to)

tools and equipment: pitot tube, Y-isolation valves, fire hoses, fire hydrant wrenches, diffusers, burlap sack with tie wires

Task B-8 Installs fire pump units

Task Descriptor

Fire pump units are an integral part of fire protection systems. They provide pressure and flow to the fire protection system. They can be used with stand-alone or secondary water supplies, or as a supplement to municipal water supply.

Sprinkler fitters coordinate with designers and engineers to determine the location of pumps, drivers, controllers and components. They install pumps, drivers, controllers and components according to standards and site conditions.

B-8.01 Determines location of pumps, drivers, controllers and components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-8.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-8.01.02P	inspect room layout	room layout is inspected prior to installation to confirm adequate space, lighting, permanent heating and drainage, and to prevent interference of pumps and components with other building services
B-8.01.03P	verify layout with drawings	layout is verified with drawings to ensure compliance with specifications
B-8.01.04P	lay out **pumps** and components	**pumps** and components are laid out in pump room to ensure accessibility for service and compliance with **specifications**

Reference Code	Performance Criteria	Evidence of Attainment
B-8.01.05P	verify if pump bypass is required	pump bypass requirements are verified according to mechanical engineered shop drawings, AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

pumps: centrifugal, positive displacement, vertical shaft, horizontal split case, end suction, vertical inline

specifications: schematic drawings, shop drawings, spool drawings, codes and standards, pump manufacturers' installation guidelines

Knowledge

Reference Code	Learning Outcomes and Objectives
B-8.01.01L	demonstrate knowledge of **pumps**, **drivers**, controllers, their components, characteristics, applications and operation
a.	identify **pumps**, **drivers**, controllers, and their components, and describe their characteristics and applications
b.	describe operating principles of **pumps**, **drivers,** controllers, and their components
c.	interpret information about **pumps**, **drivers**, controllers, and their components found on drawings and specifications
B-8.01.02L	demonstrate knowledge of requirements and methods used to determine location of **pumps**, **drivers**, controllers and components
a.	identify tools and equipment used to determine location of **pumps**, **drivers**, controllers and components, and describe their procedures for use
b.	describe requirements and methods to determine location and accessibility of **pumps**, **drivers**, controllers and components
B-8.01.03L	demonstrate knowledge of water source connections
a.	identify types of water supplies used for fire pump installations and system hydraulic demand requirements
b.	identify impacts of cross-connection control as they relate to fire pump and hydraulic demand

Reference Code	Learning Outcomes and Objectives
B-8.01.04L	demonstrate knowledge of regulatory requirements for determining location of **pumps**, **drivers**, controllers and components
a.	identify codes, standards and regulations for determining location of **pumps**, **drivers**, controllers and components
B-8.01.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection such as location of fuel tanks and lines

Range of Variables (include, but not limited to)

pumps: centrifugal, positive displacement, vertical shaft, horizontal split case, end suction, vertical inline
drivers: diesel, electric, steam

B-8.02 Installs pumps, drivers, controllers and components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-8.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-8.02.02P	place pumps	pumps are placed in predetermined locations on elevated base or pad according to manufacturers' specifications, and codes, standards and regulations
B-8.02.03P	adjust pump elevation	pump elevation is adjusted to set and secure pump in place using **materials**
B-8.02.04P	mount controllers and power transfer switches	controllers and power transfer switches are mounted in desired location within pump room and within sight of pump according to codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
B-8.02.05P	connect piping and fire **pump components**	piping and fire **pump components** are connected to fire pump, jockey pump and controllers according to AHJ, manufacturers' specifications, and codes, standards and regulations
B-8.02.06P	connect and align driver	driver is connected to and aligned with pump using **drive components** to provide power to pump
B-8.02.07P	set fuel tanks and piping	fuel tanks and piping are set to allow fuel supply to diesel driver according to AHJ, manufacturers' specifications, and codes, standards and regulations
B-8.02.08P	install fuel lines	fuel lines between tank and engine are installed according to AHJ, manufacturers' specifications, and codes, standards and regulations
B-8.02.09P	install exhaust system	exhaust system is installed to evacuate exhaust from pump room to exterior according to AHJ, manufacturers' specifications, and codes, standards and regulations
B-8.02.10P	install strainers	strainers are installed to protect pump from debris from **raw water sources**
B-8.02.11P	ensure operation of equipment and components	equipment and components operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

materials: shims, mounts, grout, concrete

pump components: sensing lines, test headers, flowmeters, bypass connections, relief and circulation valves, controller cabinets, suction and discharge piping, anti-vortex plate, suction strainers, check valves, control valves

drive components: right-angle gear drives, universal joints, flexible couplings

raw water sources: wet pits, open reservoirs, penstocks, lakes, streams, rivers, ponds, flumes, draft ports

Knowledge

Reference Code	Learning Outcomes and Objectives
B-8.02.01L	demonstrate knowledge of **pumps**, **drivers**, controllers, their **components**, characteristics, applications and operation
a.	identify **pumps**, **drivers**, controllers, and their **components**, and describe their characteristics and applications
b.	describe operating principles of **pumps**, **drivers,** controllers and their **components**
c.	interpret information about **pumps**, **drivers**, controllers and their **components** found on drawings and specifications
B-8.02.02L	demonstrate knowledge of water source connections
a.	identify **types of water supplies** used for fire pump installations and hydraulic system demand requirements
b.	identify impacts of cross-connection control as they relate to fire pump and hydraulic demand
B-8.02.03L	demonstrate knowledge of procedures to install **pumps**, **drivers**, controllers and their **components**
a.	identify tools and equipment used to install **pumps**, **drivers**, controllers, and their **components**, and describe their procedures for use
b.	describe procedures to install **pumps**, **drivers**, controllers and their **components**
B-8.02.04L	demonstrate knowledge of regulatory requirements for **pumps**, **drivers**, controllers and their **components**
a.	identify codes, standards and regulations for **pumps**, **drivers**, controllers and their **components**

Range of Variables (include, but not limited to)

pumps: centrifugal, positive displacement, vertical shaft, horizontal split case, end suction, vertical inline

drivers: diesel, electric, steam

components (pump): sensing lines, test headers, flowmeters, bypass connections, relief and circulation valves, controller cabinets, suction and discharge piping, anti-vortex plate, suction strainers, check valves, control valves

components (drive): right-angle gear drives, universal joints, flexible couplings

types of water supplies: municipal, private, tanks, reservoirs, raw, potable and non-potable

Task B-9 Installs fire department connections

Task Descriptor

Fire department connections are an important component found on most sprinkler and standpipe systems. When a sprinkler system activates, the fire department can connect hose lines from a pumper truck to the fire department connection. This connection allows the fire department to supplement water to the fire protection system in the event of a fire.

Sprinkler fitters, in consultation with AHJ, determine the location, size and type of fire department connections. They install fire department connections and their ancillary equipment according to municipal requirements to ensure they are functional and easily accessible to fire department services.

B-9.01 Determines location, size and type of fire department connections

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-9.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-9.01.02P	confirm fire department connection and piping layout with drawings	fire department connection and piping layout is confirmed prior to installation to verify adequate space, heating, drainage, code requirements and accessibility for fire department, according to AHJ, and codes, standards and regulations
B-9.01.03P	verify size and type of **hose connection**, check valves and additional components	size and type of **hose connection**, check valves and additional components are verified according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

hose connections: CSA, quick-connect, Storz, AHJ approved

Knowledge

Reference Code	Learning Outcomes and Objectives
B-9.01.01L	demonstrate knowledge of fire department connections, their components, characteristics, applications and operation
a.	identify **types of fire department connections**, and describe their characteristics, applications and **installation requirements**
b.	describe operating principles of fire department connections
c.	interpret information about fire department connections found on drawings and specifications
B-9.01.02L	demonstrate knowledge of procedures to determine location, size and **type of fire department connections**
a.	describe procedures to determine location, size and **type of fire department connections**
b.	identify required proximity of fire department connections in relation to hydrants and fire department access
B-9.01.03L	demonstrate knowledge of regulatory requirements for fire department connections
a.	identify codes, standards and regulations for fire department connections

Range of Variables (include, but not limited to)

types of fire department connections: free-standing, exposed, flush, dry
installation requirements: requirements for check valves, placement of fire department connections, requirements for drainage of fire department connections, requirements for hose thread connections

B-9.02 Installs fire department connections, piping and components

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-9.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task

Reference Code	Performance Criteria	Evidence of Attainment
B-9.02.02P	install pipe, devices and signage for fire department connections	pipe, devices and signage for fire department connections are installed according to AHJ, and codes, standards and regulations
B-9.02.03P	confirm orientation and thread compatibility of fire department connections	fire department connections are oriented to achieve desired position, and threads are confirmed to be compatible according to site conditions, application, manufacturers' specifications and AHJ

Knowledge

Reference Code	Learning Outcomes and Objectives
B-9.02.01L	demonstrate knowledge of fire department connections, their components, characteristics, applications and operation
a.	identify **types of fire department connections**, and describe their characteristics, applications and **installation requirements**
b.	describe operating principles of fire department connections
c.	interpret information about fire department connections found on drawings and specifications
B-9.02.02L	demonstrate knowledge of procedures to install fire department connection piping and components
a.	identify tools and equipment used to install fire department connection piping and components, and describe their procedures for use
b.	describe procedures to install fire department connection piping and components
c.	identify required proximity of fire department connections in relation to hydrants and fire department access
B-9.02.03L	demonstrate knowledge of regulatory requirements for fire department connections
a.	identify codes, standards and regulations for fire department connections

Range of Variables (include, but not limited to)

types of fire department connections: free-standing, exposed, flush, dry
installation requirements: requirements for check valves, placement of fire department connections, requirements for drainage of fire department connections, requirements for hose thread connections

Task B-10 Installs private water supply systems

Task Descriptor

Private water supply systems are typically the only water supply for the fire protection system in remote areas. They may also be used as a secondary supply in areas where municipal supply is insufficient.

Sprinkler fitters install tanks and connect to the fire protection system.

B-10.01 Installs water tanks

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-10.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-10.01.02P	determine location and place water tank	location of water tank is determined, and tank is placed according to site conditions, accessibility and load-bearing requirements
B-10.01.03P	arrange for installation of base, mounts and anchors	base, mounts and anchors are installed to level, stabilize and support tank
B-10.01.04P	apply cathodic and corrosion protection	cathodic protection is installed as required to prevent electrolysis, and corrosion protection is applied to prevent exterior and interior corrosion

Reference Code	Performance Criteria	Evidence of Attainment
B-10.01.05P	fill water tank with water	water tank is filled with water to verify its integrity according to project and manufacturers' specifications, AHJ, and codes, standards and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
B-10.01.01L	demonstrate knowledge of water tanks, their components, characteristics, applications and operation
a.	identify **types of water tanks**, and describe their **characteristics** and applications
b.	identify **types of water connections** and their components, and describe their characteristics and applications
c.	describe operating principles of water tanks
d.	interpret information about water tanks found on drawings and specifications
B-10.01.02L	demonstrate knowledge of procedures to install water tanks
a.	identify tools and equipment used to install water tanks, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices to install water tanks
c.	describe procedures to install water tanks
d.	identify methods used for cathodic and corrosion protection of tanks
e.	identify methods to calculate volume, weights and elevation pressures
B-10.01.03L	demonstrate knowledge of regulatory requirements for water tanks
a.	identify codes, standards and regulations for water tanks
B-10.01.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices of water tank installation and securement that prevent water loss and collapse of water tank

Range of Variables (include, but not limited to)

types of water tanks: gravity, pressure, below grade (underground), residential water supply, ground-level storage, break

characteristics (water tanks): metal, plastic, wood, embankment-supported rubberized fabric (ESRF)

types of water connections: sprinkler valves, autofill valves

B-10.02 Installs related equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
B-10.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task
B-10.02.02P	install **controlling devices**	**controlling devices** are installed on tank and in reservoirs according to AHJ, and codes, standards and regulations
B-10.02.03P	install **hydrants**	**hydrants** are installed according to AHJ, and codes, standards and regulations
B-10.02.04P	install fill line	fill line is installed to tank to allow for automatic and periodic filling of water supply tank
B-10.02.05P	connect test connection and relief valve discharge	test connection and relief valve discharge from fire pump is connected to tank to conserve water during testing procedures according to site conditions and AHJ
B-10.02.06P	verify installation of anti-vortex plate	installation of anti-vortex plate is verified to be done when required by site conditions and AHJ
B-10.02.07P	install tank heating system	tank heating system is installed according to project and manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

controlling devices: pressure switches, agitators, circulators, control valves, thermostats, check valves, autofill valves, shut-off valves

hydrants: wall, roof, dry barrel, wet barrel

Knowledge

Reference Code	Learning Outcomes and Objectives
B-10.02.01L	demonstrate knowledge of water tanks and **related equipment**, their components, characteristics, applications and operation
a.	identify types of water tanks and **related equipment**, and describe their characteristics and applications
b.	identify types of **controlling devices**, and describe their characteristics and applications
c.	describe operating principles of water tanks and **related equipment**
d.	interpret information about water tanks and **related equipment** found on drawings and specifications
B-10.02.02L	demonstrate knowledge of procedures to install **related equipment**
a.	identify tools and equipment used to install **related equipment**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices to install **related equipment**
c.	describe procedures to install **related equipment**
d.	explain supply and discharge piping requirements
e.	identify arrangement of fire pump suction components
B-10.02.03L	demonstrate knowledge of regulatory requirements for water tanks and **related equipment**
a.	identify codes, standards and regulations for water tanks and **related equipment**

Range of Variables (include, but not limited to)

related equipment: overflow, vent, water level, drain and heating systems; access hatches; pumps

controlling devices: pressure switches, agitators, circulators, control valves, thermostats, check valves, autofill valve, shut-off valve

Major Work Activity C—Installs piping

Task C-11 Prepares pipe, tube and fittings for installation

Task Descriptor

Sprinkler fitters prepare pipe, tube and fittings for the installation of the fire protection system. This preparation can be done at a shop or on-site. This includes cutting, bending, threading, grooving, drilling and grinding.

C-11.01 Cuts pipe and tube

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

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, **pipe material** and size
C-11.01.02P	select pipe	pipe is selected according to drawings, project specifications and task
C-11.01.03P	calculate, measure and mark pipe	pipe requirements are calculated, measured and marked according to drawings, project specifications and task
C-11.01.04P	cut and verify pipe	pipe is cut and verified according to drawings, manufacturers' and project specifications, and task
C-11.01.05P	ream pipe	pipe is reamed to remove burrs to promote hydraulic efficiency

Range of Variables (include, but not limited to)

pipe material: steel, copper, non-metallic, ductile iron

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.01.01L	demonstrate knowledge of pipe and tube, their characteristics and applications
a.	identify types of pipe and tube, and describe their characteristics and applications
b.	interpret information about cutting pipe and tube found on drawings and specifications
c.	identify **factors to consider** for selecting pipe and tube for cutting
C-11.01.02L	demonstrate knowledge of procedures to measure and cut pipe and tube
a.	identify tools and equipment used to cut pipe and tube, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for cutting pipe and tube
c.	describe procedures to cut and verify pipe and tube
d.	explain **trade math concepts** for piping
e.	apply metric and imperial measurements
C-11.01.03L	demonstrate knowledge of regulatory requirements for cutting pipe and tube
a.	identify codes, standards and regulations for cutting pipe and tube
C-11.01.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle pipe and tube

Range of Variables (include, but not limited to)

factors to consider: size, materials, schedule, NFPA standards

trade math concepts: Pythagorean theorem, algebra, trigonometry, area and capacity, converting units of measurement

C-11.02 Bends pipe and tube

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.02.01P	select pipe schedule and **pipe material**	pipe schedule and **pipe material** is selected according to drawings, project specifications, task, and codes, standards and regulations
C-11.02.02P	select application and location of bend	application and location for bend is selected according to codes, standards and regulations
C-11.02.03P	determine radius of bend	radius of bend is determined according to codes, standards and regulations
C-11.02.04P	calculate bend angle	bend angle is calculated according to installation requirements and site conditions
C-11.02.05P	select and use tools and equipment	tools and equipment are selected and used according to task, **pipe material** and size
C-11.02.06P	bend pipe and tube	pipe and tube are bent to calculated angle

Range of Variables (include, but not limited to)

pipe material: stainless, copper alloy, carbon steel

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.02.01L	demonstrate knowledge of pipe and tube, their characteristics and applications
a.	identify types of pipe and tube, and describe their characteristics and applications
b.	interpret information about bending pipe and tube found on drawings and specifications
c.	identify **factors to consider** for selecting pipe and tube for bending
C-11.02.02L	demonstrate knowledge of procedures to measure and bend pipe and tube
a.	identify tools and equipment used to bend pipe and tube, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for bending pipe and tube
c.	describe procedures to bend pipe and tube
d.	describe basic trigonometry used to calculate angles
e.	apply metric and imperial measurements
f.	describe procedures to inspect bent pipe and tube
C-11.02.03L	demonstrate knowledge of regulatory requirements for bending pipe and tube
a.	identify codes, standards and regulations for bending pipe and tube

Range of Variables (include, but not limited to)

factors to consider: size, material, schedule, manufacturers' specifications, NFPA standards

C-11.03 Threads pipe

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.03.01P	select pipe schedule and material	pipe schedule and material is selected according to drawings, project specifications, and codes, standards and regulations
C-11.03.02P	select and use tools and equipment	tools and equipment are selected and used according to size and type of material
C-11.03.03P	support pipe	pipe is supported using pipe stands while threading to prevent damage to thread and equipment
C-11.03.04P	adjust die head	die head is adjusted to achieve **thread specifications**
C-11.03.05P	select and apply cutting oil	cutting oil is selected and applied according to piping material and compatibility
C-11.03.06P	thread pipe	pipe is threaded according to **thread specifications**
C-11.03.07P	clean inside and outside of pipe	inside and outside of pipe is cleaned to remove excess cutting oil and shavings
C-11.03.08P	verify thread	thread is verified according to **thread specifications**
C-11.03.09P	dispose of hazardous waste	hazardous waste is disposed of according to codes, standards and regulations

Range of Variables (include, but not limited to)

thread specifications: thread depth, taper, pitch, angle, length

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.03.01L	demonstrate knowledge of pipes, their characteristics and applications
a.	identify types of pipe, and describe their characteristics and applications
b.	identify **types of thread**, and describe their **thread specifications**, characteristics and applications
c.	interpret information about threading pipe found on drawings and specifications
C-11.03.02L	demonstrate knowledge of procedures to thread pipe
a.	identify tools and equipment used to thread pipe, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for threading pipe
c.	describe procedures to thread pipe
d.	describe procedures to verify threads
e.	describe procedures to clean pipe after threading
f.	identify types of cutting oils, and describe their characteristics and applications
C-11.03.03L	demonstrate knowledge of regulatory requirements for threading pipe
a.	identify codes, standards and regulations for threading pipe
C-11.03.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle cutting oils and shavings

Range of Variables (include, but not limited to)

types of thread: National Pipe Thread (NPT), National Standard Thread (NST), taper, parallel

thread specifications: thread depth, taper, pitch, angle, length

C-11.04 Grooves pipe and tube

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.04.01P	select pipe or tube schedule and material	pipe or tube schedule and material is selected according to drawings, project specifications, task, and codes, standards and regulations
C-11.04.02P	select **grooving method**	**grooving method** is selected according to manufacturers' specifications, and pipe schedule, material and size
C-11.04.03P	select and use tools and equipment	tools and equipment are selected and used according to task
C-11.04.04P	set up equipment	equipment is set up to achieve groove depth according to manufacturers' specifications
C-11.04.05P	support pipe or tube	pipe or tube is supported using pipe stands to prevent damage to groove and equipment
C-11.04.06P	select and apply cutting oil	cutting oil is selected and applied according to piping material and compatibility
C-11.04.07P	measure and verify **groove dimensions**	**groove dimensions** are measured and verified to ensure they are within manufacturers' specifications
C-11.04.08P	dispose of hazardous waste	hazardous waste is disposed of according to codes, standards and regulations

Range of Variables (include, but not limited to)

grooving methods: roll grooving, cut grooving
groove dimensions: depth, flare, gasket seat, width, diameter, consistent diameter

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.04.01L	demonstrate knowledge of pipe and tube, their characteristics and applications
a.	identify types of pipe and tube, and describe their characteristics and applications
b.	interpret information about grooving pipe and tube found on drawings and specifications
C-11.04.02L	demonstrate knowledge of procedures to groove pipe
a.	identify tools and equipment used to groove pipe, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for grooving pipe
c.	describe procedures to groove pipe, and associated **grooving methods**
d.	describe procedures to measure and verify grooves
e.	identify types of cutting oils, and describe their characteristics and applications
C-11.04.03L	demonstrate knowledge of regulatory requirements for grooving pipe
a.	identify codes, standards and regulations for grooving pipe
C-11.04.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle cutting oils and shavings

Range of Variables (include, but not limited to)

grooving methods: roll grooving, cut grooving

C-11.05 Drills pipe and tube

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.05.01P	measure and mark pipe and tube	pipe and tube is measured and marked according to drawings, project specifications and task
C-11.05.02P	select and use tools and equipment	tools and equipment are selected and used according to task
C-11.05.03P	find centre of pipe or tube	centre of pipe or tube is found using centring tool
C-11.05.04P	drill hole in pipe or tube	hole in pipe or tube is drilled according to fitting and device specifications
C-11.05.05P	file hole	hole is filed to remove burrs
C-11.05.06P	recover cut-out disc	cut-out disc is recovered to prevent obstruction to flow
C-11.05.07P	clean inside and outside of pipe or tube	inside and outside of pipe or tube is cleaned to remove foreign materials

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.05.01L	demonstrate knowledge of pipe and tube, their characteristics and applications
a.	identify types of pipe and tube, and describe their characteristics and applications
b.	interpret information about drilling pipe and tube found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
C-11.05.02L	demonstrate knowledge of procedures to drill pipe and tube
a.	identify tools and equipment used to drill pipe and tube, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for drilling pipe and tube
c.	describe procedures to drill pipe and tube
d.	describe procedures to determine centre of pipe and tube
e.	describe procedures to clean pipe and tube after drilling
C-11.05.03L	demonstrate knowledge of regulatory requirements for drilling pipe and tube
a.	identify codes, standards and regulations for drilling pipe and tube
C-11.05.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle pipe and tube

C-11.06 Grinds pipe

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.06.01P	select and use tools and equipment	tools and equipment are selected and used according to task
C-11.06.02P	secure pipe	pipe is secured while grinding to prevent damage to pipe and equipment
C-11.06.03P	grind pipe ends	pipe ends are ground to ensure they are square and true
C-11.06.04P	bevel pipe	pipe is bevelled at angle to promote weld penetration according to industry standards and manufacturers' specifications

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.06.01L	demonstrate knowledge of pipe, their characteristics and applications
a.	identify types of pipe, and describe their characteristics and applications
b.	interpret information about grinding pipe found on drawings and specifications
C-11.06.02L	demonstrate knowledge of procedures to grind pipe
a.	identify tools and equipment used to grind pipe, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for grinding pipe
c.	describe procedures to grind pipe
d.	describe procedures to bevel pipe
C-11.06.03L	demonstrate knowledge of regulatory requirements for grinding pipe
a.	identify codes, standards and regulations for grinding pipe

C-11.07 Prepares fittings

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-11.07.01P	select fittings	fittings are selected according to **connection type**, pipe size drawings, project specifications and task
C-11.07.02P	inspect fitting	fitting is inspected for **deficiencies**
C-11.07.03P	select and use **tools and materials**	**tools and materials** are selected and used according to task and standards
C-11.07.04P	clean, grease, sand, file, grind or flux fitting	fitting is cleaned, greased, sanded, filed, ground or fluxed according to **connection type**

Range of Variables (include, but not limited to)

connection type: flanged, threaded, grooved, soldered, brazed, welded
deficiencies: cracks, holes, absence of threads
tools and materials: wire brushes, sand cloth, files, pipe joint compound or tape, flux, gasket lube

Knowledge

Reference Code	Learning Outcomes and Objectives
C-11.07.01L	demonstrate knowledge of pipe and tube, their fittings, characteristics and applications
a.	identify types of pipe and tube, and describe their characteristics and applications
b.	identify types of **pipe and tube fitting materials**, and describe their characteristics and applications
c.	interpret information about fittings found on drawings and specifications
C-11.07.02L	demonstrate knowledge of procedures to prepare fittings
a.	identify **tools and materials** used to prepare fittings, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for preparing fittings
c.	describe **procedures to prepare fittings**
d.	describe procedures to inspect fittings
C-11.07.03L	demonstrate knowledge of regulatory requirements for preparing fittings
a.	identify codes, standards and regulations for preparing fittings
C-11.07.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle fittings

Range of Variables (include, but not limited to)

pipe and tube fitting materials: copper, non-metallic, steel, cast iron
tools and materials: wire brushes, sand cloth, files, pipe joint compound or tape, flux, gasket lube
procedures to prepare fittings: clean, grease, sand, file, grind or flux

Task C-12 Installs pipe, tube and fittings

Task Descriptor

Sprinkler fitters connect various types of pipes, tubes and fittings (steel, non-metallic and copper) to distribute water from a predetermined source to provide reliable and adequate fire protection. They are responsible for painting and labelling pipe and tube post-installation when required.

C-12.01 Installs steel pipe, tube and fittings

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-12.01.01P	verify location and spacing	location and spacing are verified according to drawings, project specifications, and codes, standards and regulations
C-12.01.02P	modify steel pipe and tube layout	steel pipe and tube layout is modified according to site conditions and **design considerations**
C-12.01.03P	select and use tools and equipment	tools and equipment are selected and used according to task
C-12.01.04P	install **fittings** on steel pipe and tube	**fittings** are installed on steel pipe and tube according to drawings, project specifications, and codes, standards and regulations
C-12.01.05P	install steel pipe and tube in hangers, supports, restraints and bracing	steel pipe and tube are installed in hangers, supports, restraints and bracing according to drawings, project specifications, and codes, standards and regulations
C-12.01.06P	connect steel pipes and tubes	steel pipes and tubes are connected using **fittings** according to drawings, and project and manufacturers' specifications
C-12.01.07P	orient **fittings**	**fittings** are oriented according to application and site conditions

Reference Code	Performance Criteria	Evidence of Attainment
C-12.01.08P	level or pitch steel pipe and tube	steel pipe and tube is run level or pitched according to drawings, project specifications, and codes, standards and regulations
C-12.01.09P	install rigid joints, flexible joints or seismic separation assemblies	rigid joints, flexible joints or seismic separation assemblies are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

design considerations: pipe size, hazard classifications, drainage, pitch and layout, materials, system design

fittings: couplings, flanges, elbows, tees, crosses, adaptors

Knowledge

Reference Code	Learning Outcomes and Objectives
C-12.01.01L	demonstrate knowledge of steel pipe, tube and **fittings**, their characteristics and applications
a.	identify **types of steel pipe**, **tube** and **fittings**, and describe their characteristics and applications
b.	interpret information about steel pipe, tube and **fittings** installation found on drawings and specifications
C-12.01.02L	demonstrate knowledge of procedures to install steel pipe, tube and **fittings**
a.	identify tools and equipment used to install steel pipe, tube and **fittings**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing steel pipe, tube and **fittings**
c.	describe procedures to install steel pipe, tube and **fittings**
d.	describe **connection types** related to steel pipe and tube
e.	explain friction loss as it applies to steel pipe schedules and hydraulically calculated systems
f.	identify **design considerations** for installing steel pipe, tube and **fittings**
g.	describe procedures to install rigid joints, flexible joints or seismic separation assemblies
C-12.01.03L	demonstrate knowledge of training and certification requirements to weld steel pipe, tube and **fittings**

Reference Code	Learning Outcomes and Objectives
a.	identify training and certification requirements to weld steel pipe, tube and **fittings**
C-12.01.04L	demonstrate knowledge of regulatory requirements for installing steel pipe, tube and **fittings**
a.	identify codes, standards and regulations for installing steel pipe, tube and **fittings**
C-12.01.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle steel pipe, tube and **fittings**

Range of Variables (include, but not limited to)

fittings: couplings, flanges, elbows, tees, crosses, adaptors
types of steel pipe: stainless, galvanized, carbon
types of steel tube: stainless, mild
connection types: grooved couplings, flanged, threaded, welded
design considerations: pipe size, hazard classifications, drainage, pitch and layout, materials, system design

C-12.02 Installs non-metallic pipe, tube and fittings

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-12.02.01P	verify location and spacing	location and spacing are verified according to drawings, project specifications, and codes, standards and regulations
C-12.02.02P	modify non-metallic pipe and tube layout	non-metallic pipe and tube layout is modified according to site conditions and **design considerations**
C-12.02.03P	select and use tools and equipment	tools and equipment are selected and used according to task

Reference Code	Performance Criteria	Evidence of Attainment
C-12.02.04P	install **fittings** on non-metallic pipe and tube	**fittings** are installed on non-metallic pipe and tube according to drawings, project specifications, and codes, standards and regulations
C-12.02.05P	install non-metallic pipe and tube in hangers, supports, restraints and bracing	non-metallic pipe and tube are installed in hangers, supports, restraints and bracing according to drawings, project specifications, and codes, standards and regulations
C-12.02.06P	connect non-metallic pipes and tubes	non-metallic pipes and tubes are connected using **fittings** according to drawings, and project and manufacturers' specifications
C-12.02.07P	orient **fittings**	**fittings** are oriented according to application and site conditions
C-12.02.08P	level or pitch non-metallic pipe and tube	non-metallic pipe and tube are run level or pitched according to drawings, project specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

design considerations: pipe size, hazard classifications, drainage, pitch and layout, materials, system design, flushing connections, friction loss

fittings: couplings, flanges, elbows, tees, crosses, adaptors

Knowledge

Reference Code	Learning Outcomes and Objectives
C-12.02.01L	demonstrate knowledge of non-metallic pipe, tube and **fittings**, their characteristics and applications
a.	identify **types of non-metallic pipe, tube** and **fittings**, and describe their characteristics and applications
b.	interpret information about non-metallic pipe, tube and **fittings** installation found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
C-12.02.02L	demonstrate knowledge of procedures to install non-metallic pipe, tube and **fittings**
a.	identify tools and equipment used to install non-metallic pipe, tube and **fittings**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing non-metallic pipe, tube and **fittings**
c.	describe procedures to install non-metallic pipe, tube and **fittings**
d.	identify **design considerations** for installing non-metallic pipe, tube and **fittings**
e.	describe **connection types** related to non-metallic pipe and tube
C-12.02.03L	demonstrate knowledge of regulatory requirements for installing non-metallic pipe, tube and **fittings**
a.	identify codes, standards and regulations for installing non-metallic pipe, tube and **fittings**
C-12.02.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle non-metallic pipe, tube and **fittings**

Range of Variables (include, but not limited to)

fittings: couplings, flanges, elbows, tees, crosses, adaptors

types of non-metallic pipe and tube: CPVC, cross-linked polyethylene (PEX), polyvinyl chloride (PVC)

design considerations: pipe size, hazard classifications, drainage, pitch and layout, materials, system design, flushing connections, friction loss

connection types: grooved couplings, flanged, threaded, solvent welded

C-12.03 Installs copper pipe, tube and fittings

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-12.03.01P	verify location and spacing	location and spacing are verified according to drawings, project specifications, and codes, standards and regulations
C-12.03.02P	modify copper pipe and tube layout	copper pipe and tube layout is modified according to site conditions and **design considerations**
C-12.03.03P	select and use tools and equipment	tools and equipment are selected and used according to task
C-12.03.04P	select **materials**	**materials** are selected according to drawings, project specifications, and codes, standards and regulations
C-12.03.05P	prepare copper pipe and tube	copper pipe and tube is prepared for installation according to manufacturers' specifications, and codes, standards and regulations
C-12.03.06P	install **fittings** on pipe and tube	**fittings** are installed on pipe and tube according to drawings, project specifications, and codes, standards and regulations
C-12.03.07P	install dielectric **fittings**	dielectric **fittings** are installed when joining dissimilar metals
C-12.03.08P	install copper pipe and tube in hangers, supports, restraints and bracing	copper pipe and tube are installed in hangers, supports, restraints and bracing according to drawings, project specifications, and codes, standards and regulations
C-12.03.09P	connect copper pipes and tubes	copper pipes and tubes are connected using **fittings** according to drawings, and project and manufacturers' specifications
C-12.03.10P	orient **fittings**	**fittings** are oriented according to application and site conditions

Reference Code	Performance Criteria	Evidence of Attainment
C-12.03.11P	level or pitch copper pipe and tube	copper pipe and tube are run level or pitched according to drawings, project specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

design considerations: pipe size, hazard classifications, drainage, pitch and layout, materials, system design, flushing connections, friction loss

materials: solder, brazing rods, flux, sand cloth

fittings: couplings, flanges, elbows, tees, crosses, adaptors

Knowledge

Reference Code	Learning Outcomes and Objectives
C-12.03.01L	demonstrate knowledge of copper pipe, tube and **fittings**, their components, characteristics, applications and operation
a.	identify **types of copper pipe**, tube and **fittings**, and describe their characteristics and applications
b.	interpret information about copper pipe, tube and **fittings** found on drawings and specifications
C-12.03.02L	demonstrate knowledge of procedures to install copper pipe, tube and **fittings**
a.	identify tools and equipment used to install copper pipe, tube and **fittings**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing copper pipe, tube and **fittings**
c.	describe procedures to install copper pipe, tube and **fittings**
d.	describe **connection types** related to copper pipe and tube
e.	explain effect of electrolysis on piping and tubing materials
f.	explain effect of galvanic corrosion on piping and tubing materials
g.	explain friction loss as it applies to copper pipe and tube, and hydraulically calculated systems
h.	identify **design considerations** for installing copper pipe, tube and **fittings**
i.	describe procedures to prepare and assemble flare and compression joints using hand tools

Reference Code	Learning Outcomes and Objectives
C-12.03.03L	demonstrate knowledge of procedures to braze and solder joints
a.	identify tools and equipment used to braze and solder joints, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for brazing and soldering joints
c.	describe procedures to braze and solder joints
d.	identify **materials** and equipment used for brazing and soldering joints, and describe their applications
e.	identify **types of solders and brazing alloys**, and describe their characteristics and applications
f.	identify types of flux used in soldering or brazing, and describe their purpose, applications and effects
C-12.03.04L	demonstrate knowledge of regulatory requirements for installing copper pipe, tube and **fittings**
a.	identify codes, standards and regulations for installing copper pipe, tube and **fittings**
b.	identify codes, standards and regulations for brazing and soldering joints
C-12.03.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle copper pipe, tube and **fittings**
c.	describe procedures to dispose of and recycle brazing and soldering material

Range of Variables (include, but not limited to)

fittings: couplings, flanges, elbows, tees, crosses, adaptors

types of copper pipe and tube: K, L, M, drawn (hard), annealed (soft)

connection types: soldering, brazing, grooved couplings, compression fittings, threading

design considerations: pipe size, hazard classifications, drainage, pitch and layout, materials, system design, flushing connections, friction loss

materials: solder, brazing rods, flux, sand cloth

types of solders and brazing alloys: 50/50, 95/5, lead-free, BCuP, BAg

C-12.04 Paints and labels pipe, tube and fittings

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-12.04.01P	select and use tools and equipment	tools and equipment are selected and used according to task
C-12.04.02P	select paint	paint used for identification and corrosion protection is selected according to project and manufacturers' specifications
C-12.04.03P	mix paint and epoxy	paint and epoxy are mixed according to manufacturers’ specifications
C-12.04.04P	paint over wrench marks and bare threads	wrench marks and bare threads are painted over according to project specifications
C-12.04.05P	install labels on pipe	labels are installed on pipe according to project specifications
C-12.04.06P	dispose of hazardous waste	hazardous waste is disposed of according to codes, standards and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
C-12.04.01L	demonstrate knowledge of procedures to paint and label pipe, tube and fittings
a.	identify tools and equipment used to paint and label pipe, tube and fittings, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for painting and labelling pipe, tube and fittings
c.	describe procedures to paint and label pipe, tube and fittings
d.	identify symbols for labelling pipe, tube and fittings
e.	interpret information about labeling pipe, tube and fittings found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
C-12.04.02L	demonstrate knowledge of standards for painting and labelling pipe, tube and fittings
a.	identify standards for painting and labelling pipe, tube and fittings
C-12.04.03L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle painting and labelling materials

Task C-13 Installs piping components

Task Descriptor

Sprinkler fitters connect various types of components such as sprinklers, nozzles, valves, pipe sleeves, hangers, supports, restraints and bracing, cross-connection control assemblies and system drainage to the piping system to achieve a complete and effective fire protection system.

C-13.01 Selects sprinklers and nozzles

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-13.01.01P	identify sprinklers' temperature classification	sprinklers' temperature classification is identified according to drawings, manufacturers' and project specifications, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
C-13.01.02P	identify **sprinklers and nozzles**	**sprinklers and nozzles** are identified to provide coverage according to **conditions, occupancy classifications** and **storage arrangement**, drawings, manufacturers' and project specifications, and codes, standards and regulations
C-13.01.03P	interpret **information** on sprinkler and nozzle listing and manufacturers' data sheet	**information** on sprinkler and nozzle listing and manufacturers' data sheet is interpreted to provide installation limitations

Range of Variables (include, but not limited to)

sprinklers and nozzles: automatic (solder, bulb), standard spray (pendant, upright, sidewall), extended coverage (pendant, upright, sidewall), specialty sprinklers and nozzles (residential, institutional, control mode specific application [CMSA]/large drop, Early Suppression Fast Response [ESFR], in-rack, attic, old-style/conventional, open sprinkler, window, dry)

conditions: freezing, excessive heat, corrosive environment

occupancy classifications: light hazard, ordinary hazard, extra hazard

storage arrangement: high pile storage, in-rack, solid pile

information: listings, K-factor, temperature, date of manufacture, sprinkler identification number (SIN)

Knowledge

Reference Code	Learning Outcomes and Objectives
C-13.01.01L	demonstrate knowledge of **sprinklers and nozzles**, their components, characteristics, applications and operation
a.	identify types of **sprinklers and nozzles**, and describe their characteristics and applications
b.	describe operating principles of **sprinklers and nozzles**
c.	describe fire tetrahedron and properties of water
d.	interpret **information** about **sprinklers and nozzles** found on drawings, specifications, sprinkler and nozzle listing and manufacturers' data sheet

Reference Code	Learning Outcomes and Objectives
C-13.01.02L	demonstrate knowledge of procedures to select **sprinklers and nozzles**
a.	identify workplace hazards, and describe safe work practices for **sprinklers and nozzles**
b.	describe procedures to select **sprinklers and nozzles**
c.	identify **conditions**, hazard classification and **storage arrangements** for selecting sprinklers
d.	identify **temperature ratings** and colour coding
e.	identify **performance characteristics** that apply to sprinklers
f.	identify **location requirements**
C-13.01.03L	demonstrate knowledge of regulatory requirements for **sprinklers and nozzles**
a.	identify codes, standards and regulations for **sprinklers and nozzles**

Range of Variables (include, but not limited to)

sprinklers and nozzles: automatic (solder, bulb), standard spray (pendant, upright, sidewall), extended coverage (pendant, upright, sidewall), specialty sprinklers and nozzles (residential, institutional, CMSA/large drop, ESFR, in-rack, attic, old-style/conventional, open sprinkler, window, dry)

information: listings, K-factor, temperature, date of manufacture, SIN

conditions: freezing, excessive heat, corrosive environment

storage arrangement: high pile storage, in-rack, solid pile

temperature ratings: ordinary, intermediate, high, extra-high

performance characteristics: deflector design/spray patterns, orifice size, temperature rating, temperature sensitivity, orientation

location requirements: bays, beams, girders, joists, open bar joists, open ceilings, trusses, obstructions

C-13.02 Installs sprinklers and nozzles

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-13.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
C-13.02.02P	inspect sprinklers and **nozzles** for **damage or defects**	sprinklers and **nozzles** are inspected for **damage or defects**
C-13.02.03P	apply thread lubricant	thread lubricant is applied to prevent leakage and ensure fit according to industry practices and manufacturers' specifications
C-13.02.04P	position and install sprinklers and **nozzles**	sprinklers and **nozzles** are positioned and installed according to drawings, manufacturers’ and project specifications, and codes, standards and regulations
C-13.02.05P	select and install **temporary sprinkler protectors**	**temporary sprinkler protectors** are selected and installed to protect sprinklers and **nozzles** from potential damage until job is completed
C-13.02.06P	select and install **escutcheons and cover plates**	**escutcheons and cover plates** are selected and installed according to manufacturers' specifications
C-13.02.07P	select and install **permanent sprinkler protectors**	**permanent sprinkler protectors** are selected and installed according to manufacturers' specifications and site conditions

Range of Variables (include, but not limited to)

damage or defects: broken bulbs, bent deflectors, bad threads, corrosion, lack of air bubble, no fluid

nozzles: foam, CO_2, clean agent

temporary sprinkler protectors: manufacturers' supplied protective caps, aluminium foil, plastic bags

escutcheons and cover plates: concealed, recess, deep cup escutcheons

permanent sprinkler protectors: sprinkler guards, wax coated, paper bags, cellophane

Knowledge

Reference Code	Learning Outcomes and Objectives
C-13.02.01L	demonstrate knowledge of sprinklers and **nozzles**, their components, characteristics, applications and operation
a.	identify types of sprinklers and **nozzles**, and describe their characteristics and applications
b.	describe operating principles of sprinklers, **nozzles** and finishing plates
c.	interpret information about sprinklers and **nozzles** found on drawings and specifications
C-13.02.02L	demonstrate knowledge of procedures to install sprinklers and **nozzles** and their components
a.	identify tools and equipment used to install sprinklers and **nozzles** and their components, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing sprinklers and **nozzles** and their components
c.	describe procedures to install sprinklers and **nozzles** and their components
d.	describe procedures used, and factors to consider for the care and handling of sprinklers and **nozzles** prior to and during installation process
e.	explain importance of correct positioning for sprinklers and **nozzles**
f.	identify spacing and obstruction requirements based on **occupancy classification**, drawings, manufacturers' and project specifications, codes, standards and regulations
g.	identify clearances required between piled storage materials and sprinkler deflectors
h.	identify factors that affect maximum ceiling temperature
i.	identify **temperature ratings** and colour coding
j.	identify **performance characteristics** that apply to sprinklers and **nozzles**

Reference Code	Learning Outcomes and Objectives
C-13.02.03L	demonstrate knowledge of regulatory requirements for installing sprinklers and **nozzles**
a.	identify codes, standards and regulations for installing sprinklers and **nozzles**
C-13.02.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle sprinklers and **nozzles**

Range of Variables (include, but not limited to)

nozzles: foam, CO_2, clean agent
occupancy classifications: light hazard, ordinary hazard, extra hazard
temperature ratings: ordinary, intermediate, high, extra-high
performance characteristics: deflector design/spray patterns, orifice size, temperature rating, thermal sensitivity, orientation

C-13.03 Installs pipe sleeves

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-13.03.01P	select pipe sleeve material, diameter and length	pipe sleeve material, diameter and length are selected according to **factors**
C-13.03.02P	select and use tools and equipment	tools and equipment are selected and used according to task
C-13.03.03P	measure and determine pipe sleeve location	pipe sleeve location is measured and determined according to drawings and concrete scanning
C-13.03.04P	attach pipe sleeve to forms	pipe sleeve is attached to forms using nails or screws when installed prior to concrete pour according to industry standards

Reference Code	Performance Criteria	Evidence of Attainment
C-13.03.05P	core penetrations for pipe sleeves	penetrations are cored for pipe sleeves through existing concrete according to task
C-13.03.06P	select and apply fire stopping, caulking and sealant	fire stopping, caulking and sealant are selected and applied according to drawings, manufacturers' and project specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

factors: pipe size, wall and floor thickness, codes, standards and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
C-13.03.01L	demonstrate knowledge of pipe sleeves, their characteristics and applications
a.	identify types of pipe sleeves, and describe their characteristics and applications
b.	interpret information about pipe sleeves found on drawings, and manufacturers' and project specifications
C-13.03.02L	demonstrate knowledge of procedures to size and install pipe sleeves
a.	identify tools and equipment used to size and install pipe sleeves, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing pipe sleeves
c.	identify **factors** for selecting pipe sleeve material, diameter and length
d.	describe procedures to install pipe sleeves
e.	describe procedures to determine location of pipe sleeves
f.	describe fire rating requirements for penetrations
C-13.03.03L	demonstrate knowledge of regulatory requirements for installing sleeves
a.	identify codes, standards and regulations for installing sleeves
C-13.02.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle coring material

Range of Variables (include, but not limited to)

factors: pipe size, wall and floor thickness, codes, standards and regulations

C-13.04 Installs hangers, supports, restraints and bracing

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-13.04.01P	select **hangers**, **supports**, restraints and **bracing**	**hangers**, **supports**, restraints and **bracing** are selected according to **factors**
C-13.04.02P	select and use tools and equipment	tools and equipment are selected and used according to task
C-13.04.03P	calculate size and material of trapeze hangers	size and material of trapeze hangers is calculated according to codes, standards and regulations
C-13.04.04P	calculate rod or brace size and length	rod or brace size and length are calculated according to **factors**
C-13.04.05P	cut rod or **bracing materials**	rod or **bracing materials** are cut to length according to site conditions
C-13.04.06P	select and install attachment points for **hangers**, **supports**, restraints and **bracing**	attachment points for **hangers**, **supports**, restraints and **bracing** are selected and installed according to codes, standards and regulations
C-13.04.07P	fasten **hangers**, **supports**, restraints and **bracing**	**hangers**, **supports**, restraints and **bracing** are fastened to attachment points and piping on **structure material** according to **factors**
C-13.04.08P	select location, material, diameter, angle and length of **hangers**, **supports**, restraints and **bracing**	location, material, diameter, angle and length of **hangers**, **supports**, restraints and **bracing** are selected according to **factors**
C-13.04.09P	installs **hangers**, **supports**, restraints and **bracing** to prevent **movement**	**hangers**, **supports**, restraints and **bracing** are installed to prevent pipe **movement**

Range of Variables (include, but not limited to)

hangers: riser clamps, pipe clamps, swivel rings, clevis, split rings

supports: pipe stands, riser clamps, pipe straps

bracing: ceiling flanges, side beam attachments, C-clamps, longitudinal, lateral, restraint wire, restraint straps, 4-way

factors: pipe material; pipe size; spacing; application; codes, standards and regulations; location of structural members; drawings; AHJ; project and manufacturers' specifications; pitch

bracing materials: pipe, angle iron, rod

structure material: wood, concrete, steel, lath and plaster

movement: seismic activity, vibration, pipe thrust, water hammer, thermal expansion

Knowledge

Reference Code	Learning Outcomes and Objectives
C-13.04.01L	demonstrate knowledge of **hangers**, **supports**, restraints and **bracing**, their components, characteristics and applications
a.	identify types of **hangers**, **supports**, restraints and **bracing** used in installation of pipe and tube, and describe their characteristics and applications
b.	identify types of **bracing materials**, and describe their characteristics and applications
c.	interpret information about **hangers**, **supports**, restraints and **bracing** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
C-13.04.02L	demonstrate knowledge of procedures to install **hangers**, **supports**, restraints and **bracing**
a.	identify tools and equipment used to install **hangers**, **supports**, restraints and **bracing**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing **hangers**, **supports**, restraints and **bracing**
c.	describe procedures to install **hangers**, **supports**, restraints and **bracing**
d.	describe procedures to install **fasteners** into **structure material**
e.	identify calculations and **factors** to provide **pitch**
f.	identify **hangers**, **supports**, restraints and **bracing** requirements for various systems
g.	describe principles of sway/seismic bracing and **movement**
h.	identify types and sizes of hanger rods, and describe their characteristics and applications
i.	identify types of protective materials applied to **hangers**, and describe their purpose and applications
j.	identify types of **fasteners** and inserts, and describe their characteristics and applications
C-13.04.03L	demonstrate knowledge of regulatory requirements for **hangers**, **supports**, restraints and **bracing**
a.	identify codes, standards and regulations for **hangers**, **supports**, restraints and **bracing**
C-13.04.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle **hangers**, **supports**, restraints and **bracing**

Range of Variables (include, but not limited to)

hangers: riser clamps, pipe clamps, swivel rings, clevis, split rings

supports: pipe stands, riser clamps, pipe straps

bracing: ceiling flanges, side beam attachments, C-clamps, longitudinal, lateral, restraint wire, restraint straps, 4-way

bracing materials: pipe, angle iron, rod

fasteners: drop-in inserts, wood screws, coach screw rod, engineered fasteners

structure material: wood, concrete, steel, lath and plaster

factors: pipe material; pipe size; spacing, application; codes, standards and regulations; location of structural members; drawings; AHJ; project and manufacturers' specifications; pitch

pitch: grade on pipe, slope of ceiling, hanger spacing, distance from hanger to attachment points

C-13.05 Installs cross-connection control assemblies

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-13.05.01P	select and use tools and equipment	tools and equipment are selected and used according to task
C-13.05.02P	select and install cross-connection control assemblies	cross-connection control assemblies are selected and installed according to drawings, manufacturers' and project specifications, and codes, standards and regulations
C-13.05.03P	install means for forward flow testing	means for forward flow testing are installed according to drawings, codes and standards
C-13.05.04P	ensure operation of equipment and components	equipment and components operate according to manufacturers' specifications, and codes, standards and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
C-13.05.01L	demonstrate knowledge of cross-connection control assemblies, their components, characteristics, applications and operation
a.	identify **types of cross-connection control assemblies**, and describe their characteristics and applications
b.	describe operating principles of cross-connection control assemblies
c.	interpret information about cross-connection control assemblies found on drawings and specifications
C-13.05.02L	demonstrate knowledge of procedures to install cross-connection control assemblies
a.	identify tools and equipment used to install cross-connection control assemblies, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing cross-connection control assemblies
c.	identify factors to consider for selecting and installing cross-connection control assemblies
d.	identify means for forward flow testing, and describe their requirements, arrangements and installation location
e.	describe procedures to install cross-connection control assemblies
C-13.05.03L	demonstrate knowledge of training and certification requirements to test cross-connection control assemblies
a.	identify training and certification requirements to test cross-connection control assemblies
C-13.05.04L	demonstrate knowledge of regulatory requirements for cross-connection control assemblies
a.	identify codes, standards and regulations for cross-connection control assemblies
C-13.05.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection

Range of Variables (include, but not limited to)

types of cross-connection control assemblies: reduced pressure backflow assembly (RP [RPBA]), double check valve assembly (DCVA), air gap

C-13.06 Installs system drainage

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
C-13.06.01P	select and use tools and equipment	tools and equipment are selected and used according to task
C-13.06.02P	determine pipe size, length and locations of drain lines	pipe size, length and locations of drain lines are determined and measured according to drawings, manufacturers' and project specifications, and codes, standards and regulations
C-13.06.03P	determine locations and requirements of **components**	locations and requirements of **components** are determined according to drawings, manufacturers' and project specifications, and codes, standards and regulations
C-13.06.04P	install drain lines	drain lines are installed according to drawings, manufacturers' and project specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: drain valves, drain cups, air gaps

Knowledge

Reference Code	Learning Outcomes and Objectives
C-13.06.01L	demonstrate knowledge of system drainage, their **components**, characteristics, applications and operation
a.	identify **types of system drainage**, and describe their characteristics and applications
b.	identify system drainage **components** and describe their location, purpose and operation
c.	describe operating principles of system drainage
d.	interpret information about system drainage found on drawings and specifications
C-13.06.02L	demonstrate knowledge of procedures to layout and install system drainage and **components**
a.	identify tools and equipment used to layout and install system drainage, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for system drainage layout and installation
c.	describe procedures to lay out and install system drainage and **components**
C-13.06.03L	demonstrate knowledge of regulatory requirements for system drainage layout and installation
a.	identify codes, standards and regulations for system drainage layout and installation
C-13.06.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle system drainage **components**

Range of Variables (include, but not limited to)

components: drain valves, drain cups, air gaps
types of system drainage: main, auxiliary, sectional

Major Work Activity D—Installs and lays out fire protection systems and devices

Task D-14 Installs water-based systems

Task Descriptor

Sprinkler fitters install water-based systems in institutional, commercial, industrial and residential buildings. These systems use water as an integral part of the suppression/control agent. They primarily remove heat from a fire to suppress or control it. Sprinkler fitters remove, replace, add and relocate system components on existing water-based systems.

D-14.01 Installs wet pipe systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-14.01.02P	determine and measure locations of mains and branch lines	locations of mains and branch lines are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.01.03P	determine requirements and measure locations of **components**	requirements and locations of **components** are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
D-14.01.04P	determine requirements, measure and document locations of auxiliary drains and valves	locations of auxiliary drains and requirements for valves are determined, measured and documented according to codes, standards and regulations to ensure accessibility for servicing and testing
D-14.01.05P	measure and fabricate **piping**	**piping** is measured and fabricated for installation according to drawings, AHJ, site conditions, and codes, standards and regulations
D-14.01.06P	measure and install return bends and flexible drops	return bends and flexible drops on wet pipe systems are measured and installed according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.01.07P	connect **piping** to water supply	**piping** is connected to water supply using **connection methods** according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.01.08P	install **auxiliary devices**	**auxiliary devices** are installed according to codes, standards and regulations to ensure accessibility for servicing and testing
D-14.01.09P	measure and install alarm valve and **trim**	alarm valve and **trim** is measured and installed according to manufacturers' specifications, and codes, standards and regulations
D-14.01.10P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.01.11P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: fire department connections, test connections and drains, sprinklers, alarm devices, control valves, alarm check valves, water flow alarm devices, relief valves, valves, flow switches, riser manifolds, air vents

piping: risers, starter pieces, drops, branch lines, feed mains, riser nipples, cross mains

connection methods: flanged, soldered, brazed, welded, grooved, threaded joints, plain end, solvent welded, fusion, compression

auxiliary devices: water motor gongs, excess pressure pumps, signalling devices, corrosion mitigation devices

trim: alarm test valves, main drains, pressure gauges

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.01.01L	demonstrate knowledge of wet pipe systems, their components, characteristics, applications and operation
a.	identify types of wet pipe systems, and describe their characteristics and applications
b.	identify wet pipe system **components** and describe their location, purpose and operation
c.	identify alarm valves to be trimmed, and describe their **components** and relevant design characteristics
d.	determine characteristics and application of sprinklers
e.	identify **design criteria** for wet pipe systems
f.	identify drainage requirements for wet pipe systems
g.	describe operating principles of wet pipe systems
h.	interpret information about wet pipe systems found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
D-14.01.02L	demonstrate knowledge of procedures to install wet pipe systems
a.	identify tools and equipment used to install wet pipe systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing wet pipe systems
c.	describe procedures to lay out and install wet pipe systems and **components**
d.	describe procedures to install alarm valve **trim**
e.	identify factors to consider and requirements for installing auxiliary drains on wet pipe systems
f.	describe preventative methods used to prevent false alarms
g.	describe procedures to verify operation of equipment and **components**
h.	identify requirements for pressure testing wet pipe systems and describe associated procedures
i.	identify **methods used to prevent freezing**
D-14.01.03L	demonstrate knowledge of regulatory requirements for installing wet pipe systems
a.	identify codes, standards and regulations for installing wet pipe systems

Range of Variables (include, but not limited to)

components: fire department connections, test connections and drains, sprinklers, alarm devices, control valves, alarm check valves, water flow alarm devices, relief valves, valves, flow switches, riser manifolds, air vents

design criteria: engineered drawings, occupancy classification, hazard classification, design area

trim: alarm test valves, main drains, pressure gauges

methods used to prevent freezing: insulation, heat tracing, keeping in heated areas, using dry sprinklers

D-14.02 Installs dry pipe systems

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

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	determine and measure locations and pitch for main and branch lines	locations and pitch for main and branch lines are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.02.03P	determine requirements and measure locations of **components**	requirements and locations of **components** are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.02.04P	determine requirements , measure and document locations of auxiliary drains and valves	locations of auxiliary drains and requirements for valves are determined, measured and documented according to codes, standards and regulations to ensure accessibility for servicing, testing and winterizing
D-14.02.05P	identify **devices**	**devices** are identified according to codes, standards and regulations in installation locations that are subject to freezing
D-14.02.06P	measure and install return bends and flexible drops	return bends and flexible drops on dry pipe systems are measured and installed according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
D-14.02.07P	connect piping to water supply	piping is connected to water supply using **connection methods** according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.02.08P	install **auxiliary devices**	**auxiliary devices** are installed according to codes, standards and regulations to ensure accessibility for servicing, testing and winterizing
D-14.02.09P	measure and install dry pipe valve and **trim**	dry pipe valve and **trim** are measured and installed according to manufacturers' specifications and codes, standards and regulations
D-14.02.10P	determine system capacity	system capacity of dry pipe systems is determined according to codes, standards and regulations
D-14.02.11P	perform calculations	calculations are performed on required fill time of compressed air or nitrogen according to codes, standards and regulations
D-14.02.12P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.02.13P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: fire department connections, test connections and drains, water flow alarm devices, control valves, dry pipe valves, regulated air supply, regulated nitrogen supply, valves, quick opening devices (QODs), anti-flooding devices, auxiliary drains, drum drips, high/low supervisory devices, pressure gauges, corrosion mitigation devices

devices: dry sprinklers, approved gaskets, air dryers

connection methods: flanged, brazed, welded, grooved, threaded joints, plain end, solvent welded, fusion, compression

auxiliary devices: water motor gongs, signalling devices

trim: signalling devices, QODs, air maintenance devices

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.02.01L	demonstrate knowledge of dry pipe systems, their **components**, characteristics, applications and operation
a.	identify **types of dry pipe systems**, and describe their characteristics and applications
b.	identify dry pipe system **components**, and describe their locations, purpose and operation
c.	describe operating principles of dry pipe systems
d.	interpret information about dry pipe systems found on drawings and specifications
D-14.02.02L	demonstrate knowledge of procedures to install dry pipe systems
a.	identify tools and equipment used to install dry pipe systems, and describe their procedures for use
b.	identify workplace hazards and describe safe work practices for installing dry pipe systems
c.	describe procedures to install dry pipe systems
d.	identify dry pipe valves to be trimmed, and describe their **components** and design characteristics
e.	identify factors to consider and requirements for installing auxiliary drains on dry pipe systems
f.	describe procedures to lay out and install dry pipe systems and **components**
g.	describe procedures to install dry pipe valve **trim**
h.	describe **preventative methods** used to prevent false alarms
i.	identify calculations for capacity of dry pipe systems and air or nitrogen supply
j.	describe procedures to verify operation of equipment and **components**
k.	identify requirements for pressure testing of dry pipe systems and describe associated procedures
D-14.02.03L	demonstrate knowledge of regulatory requirements for installing dry pipe systems
a.	identify codes, standards and regulations for installing dry pipe systems

Range of Variables (include, but not limited to)

components: fire department connections, test connections and drains, water flow alarm devices, control valves, dry pipe valves, regulated air supply, regulated nitrogen supply, valves, QODs, anti-flooding devices, auxiliary drains, drum drips, high/low supervisory devices, pressure gauges, corrosion mitigation devices

types of dry pipe systems: tree, looped

trim: signalling devices, QODs, air maintenance devices

preventative methods: use of automatic air and nitrogen supply, air maintenance device

D-14.03 Installs preaction/deluge systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.03.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-14.03.02P	determine and measure locations of main and branch lines	locations of main and branch lines are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.03.03P	determine requirements and measure locations of **components**	requirements and locations and requirements of components are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.03.04P	determine requirements , measure and document locations of auxiliary drains and valves	locations of auxiliary drains and requirements for valves are determined, measured and documented according to codes, standards and regulations to ensure accessibility for servicing, testing and winterizing

Reference Code	Performance Criteria	Evidence of Attainment
D-14.03.05P	identify **devices**	**devices** are identified according to codes, standards and regulations in installation locations that are subject to freezing
D-14.03.06P	install preaction/deluge valves and **trim**	preaction/deluge valves and **trim** are installed according to manufacturers' specifications, and codes, standards and regulations
D-14.03.07P	install return bends and flexible drops on preaction/deluge systems	return bends and flexible drops are installed on preaction/deluge systems according to codes, standards and regulations to prevent plugging of sprinklers
D-14.03.08P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.03.09P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: fire department connections, test connections and drains, water flow alarm devices, control valves, preaction/deluge valves, regulated air supply, regulated nitrogen supply, valves, QODs, anti-flooding devices, auxiliary drains, supervisory devices, pressure gauges, manual release

devices: dry sprinklers, flush seal gaskets and air dryers, detection devices

trim: solenoid actuators, diaphragm actuators

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.03.01L	demonstrate knowledge of preaction/deluge systems, their **components**, characteristics, applications and operation
a.	identify **types of preaction systems**, and describe their characteristics and **applications**
b.	identify types of deluge systems, and describe their characteristics and **applications**
c.	describe **operating principles** of preaction/deluge systems
d.	identify **trim** components used on preaction/deluge valves, and describe their design variations and applications
e.	identify types of alarms that preaction/deluge valve will operate
f.	identify **supplemental fire detection systems**, and describe their operating principles and applications
g.	identify system controls required for preaction/deluge systems
h.	interpret information about preaction/deluge systems found on drawings and specifications
D-14.03.02L	demonstrate knowledge of procedures to install and test preaction/deluge systems
a.	identify tools and equipment used to install and test preaction/deluge systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing preaction/deluge systems
c.	describe procedures to install system controls required for preaction/deluge systems
d.	explain requirements for drainage of preaction/deluge systems
e.	describe procedures to lay out and install preaction/deluge systems
f.	describe procedures to trim preaction/deluge valves
g.	describe procedures to verify operation of equipment and **components**
h.	identify requirements for pressure testing of preaction/deluge systems, and describe associated procedures
D-14.03.03L	demonstrate knowledge of regulatory requirements for preaction/deluge systems
a.	identify codes, standards and regulations for preaction/deluge systems

Range of Variables (include, but not limited to)

components: fire department connections, test connections and drains, water flow alarm devices, control valves, preaction/deluge valves, regulated air supply, regulated nitrogen supply, valves, QODs, anti-flooding devices, auxiliary drains, supervisory devices, pressure gauges, manual release

types of preaction systems: non-interlock, single interlock, double interlock

applications: computer rooms, freezers, aviation hangars, electrical facilities

operating principles: actuation and operation, preaction/deluge valve type

trim: solenoid actuators, diaphragm actuators

supplemental fire detection systems: electric, pneumatic, hydraulic

D-14.04 Installs antifreeze systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.04.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-14.04.02P	determine and measure locations of main and branch lines	locations of main and branch lines are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.04.03P	determine requirements and measure locations of **components**	requirements and locations and requirements of components are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.04.04P	determine requirements, measure and document locations of auxiliary drains and valves	locations of auxiliary drains and requirements for valves are determined, measured and documented according to codes, standards and regulations to ensure accessibility for servicing and testing

Reference Code	Performance Criteria	Evidence of Attainment
D-14.04.05P	measure and fabricate **piping**	**piping** is measured and fabricated for installation according to drawings, site conditions, AHJ, and codes, standards and regulations
D-14.04.06P	connect **piping** to water supply	**piping** is connected to water supply using **connecting methods** according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.04.07P	select premixed antifreeze solution	premixed antifreeze solution is selected according to AHJ, temperature of protected spaces, and codes, standards and regulations
D-14.04.08P	install **auxiliary devices**	**auxiliary devices** are installed according to codes, standards and regulations to ensure accessibility for servicing and testing
D-14.04.09P	vent air from system	air from system is vented at high point when filling system with antifreeze
D-14.04.10P	determine system capacity	system capacity of antifreeze system is determined according to codes, standards and regulations
D-14.04.11P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.04.12P	install **components**	**components** are installed to protect systems’ integrity
D-14.04.13P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: expansion tanks, cross-connection control, check valves
piping: risers, starter pieces, drops, branch lines, feed mains
connection methods: flanged, brazed, welded, grooved, threaded joints, plain end, solvent welded, fusion, compression
auxiliary devices: flow switches, test points, fill cups
pressure tests: hydrostatic, pneumatic testing
signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.04.01L	demonstrate knowledge of antifreeze systems, their **components**, characteristics, applications and operation
a.	identify **types of antifreeze systems**, and describe their **components**, characteristics and applications
b.	identify **types of antifreeze solutions**, and describe their characteristics and applications
c.	identify valves required for antifreeze systems, and describe their characteristics and applications
d.	describe operating principles of antifreeze systems
e.	interpret information about antifreeze systems found on drawings and specifications
D-14.04.02L	demonstrate knowledge of procedures to install and maintain antifreeze systems
a.	identify tools and equipment used to install and maintain antifreeze systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing and maintaining antifreeze systems
c.	identify **factors** to consider for determining need for antifreeze systems or freezing protection
d.	identify installation requirements for antifreeze systems
e.	describe procedures to lay out and install antifreeze systems
f.	describe procedures to verify operation of equipment and **components**
g.	identify requirements for **pressure testing** of antifreeze systems, and describe associated procedures
h.	identify requirements and describe procedures to handle and store antifreeze

Reference Code	Learning Outcomes and Objectives
D-14.04.03L	demonstrate knowledge of regulatory requirements for installing and maintaining antifreeze systems
a.	identify codes, standards and regulations for installing and maintaining antifreeze systems
D-14.04.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle antifreeze

Range of Variables (include, but not limited to)

components: expansion tanks, cross-connection control, check valves
types of antifreeze systems: antifreeze loop, cross-connection control, remote
types of antifreeze solutions: glycol, glycerin, premixed
factors: location, accessibility, cost
pressure testing: hydrostatic, pneumatic

D-14.05 Installs foam systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.05.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-14.05.02P	determine and measure locations of main and branch lines	locations of main and branch lines are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
D-14.05.03P	determine requirements and measure locations of **components**	requirements and locations of **components** are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.05.04P	determine requirements, measure and document locations of auxiliary drains and valves	locations of auxiliary drains and requirements for valves are determined, measured and documented according to codes, standards and regulations to ensure accessibility for servicing and testing
D-14.05.05P	measure and fabricate **piping**	**piping** is measured and fabricated for installation according to drawings, site conditions, AHJ, and codes, standards and regulations
D-14.05.06P	install foam tanks	foam tanks are installed in close proximity to valves to allow accessibility for refilling
D-14.05.07P	install **valves and trim**	**valves and trim** are installed according to manufacturers' specifications, and codes, standards and regulations
D-14.05.08P	install **distribution devices**	**distribution devices** are installed according to manufacturers' specifications, and codes, standards and regulations
D-14.05.09P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.05.10P	fill foam concentrate tanks	foam concentrate tanks are filled according to manufacturers' specifications using **equipment**
D-14.05.11P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: foam concentrate tanks, fire department connections, test connections and drains, water flow alarm devices, control valves, alarm/preaction/deluge valves, regulated air supply, regulated nitrogen supply, QODs, anti-flooding devices, auxiliary drains, supervisory devices, pressure gauges

piping: risers, starter pieces, drops, branch lines, feed mains

valves and trim: hydraulic and solenoid actuators, proportioners, diaphragm actuators

distribution devices: sprinklers, foam generators, nozzles

equipment (to fill foam concentrate tanks): positive displacement pumps, siphons

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.05.01L	demonstrate knowledge of foam systems, their **components**, characteristics, applications and operation
a.	identify types of foam systems, and describe their characteristics and applications
b.	identify system controls required for foam systems
c.	identify types of concentrate used in foam systems, and describe their characteristics and **applications**
d.	identify **supplemental fire detection systems**, and describe their operating principles and applications
e.	describe operating principles of foam systems
f.	interpret information about foam systems found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
D-14.05.02L	demonstrate knowledge of procedures to install foam systems
a.	identify tools and equipment used to install foam systems, and describe their procedures for use
b.	identify **workplace hazards**, and describe safe work practices for installing foam systems
c.	describe procedures to lay out and install foam systems and **components**
d.	describe **installation requirements** of foam systems
e.	describe procedures to fill foam concentrate tanks
f.	explain requirements for drainage of systems
g.	explain operation of a balanced pressure proportioning system
h.	describe procedures to trim foam systems
i.	explain operation of a pressure proportioning tank with and without bladder
j.	describe procedures to verify operation of equipment and **components**
k.	identify requirements for pressure testing of foam systems, and describe associated procedures
D-14.05.03L	demonstrate knowledge of regulatory requirements for foam systems
a.	identify codes, standards and regulations for foam systems
D-14.05.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle foam systems

Range of Variables (include, but not limited to)

components: foam concentrate tanks, fire department connections, test connections and drains, water flow alarm devices, control valves, alarm/preaction/deluge valves, regulated air supply, regulated nitrogen supply, QODs, anti-flooding devices, auxiliary drains, supervisory devices, pressure gauges

applications: aircraft hangers, fuel storage tanks, chemical manufacturing and storage facilities

supplemental fire detection systems: electric, pneumatic, hydraulic

workplace hazards: environmental considerations, containment, disposal

installation requirements: materials, hangers, supports, bracing, restraints, system actuation, testing, manufacturers' specifications

D-14.06 Installs water mist and hybrid systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.06.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-14.06.02P	determine and measure location of piping and valves	location of piping and valves are determined and measured according to manufacturers' specifications, drawings, project specifications, site conditions, AHJ and codes, standards and regulations
D-14.06.03P	determine requirements and measure locations of **components**	requirements and locations of **components** are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.06.04P	measure and fabricate **piping**	**piping** is measured and fabricated for installation according to drawings, site conditions, AHJ, and codes, standards and regulations
D-14.06.05P	connect piping to water supply	piping is connected to water supply using **connection methods** according to drawings, manufacturers' and project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.06.06P	install **auxiliary devices**	**auxiliary devices** are installed according to codes, standards and regulations to ensure accessibility for servicing and testing

Reference Code	Performance Criteria	Evidence of Attainment
D-14.06.07P	perform system flush	system is flushed to prevent plugging of nozzles according to drawings, manufacturers' and project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.06.08P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.06.09P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: positive displacement pumps, relief valves, detection devices and nozzles, nitrogen cylinders, water tanks

piping: risers, starter pieces, drops, branch lines, feed mains

connection methods: flanged, welded, grooved, threaded joints, compression

auxiliary devices: nozzles, emitters

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.06.01L	demonstrate knowledge of water mist and hybrid systems, their **components**, characteristics, applications and operation
a.	identify **types of water mist and hybrid systems**, and describe their characteristics and applications
b.	describe operating principles of water mist and hybrid systems
c.	interpret information about water mist and hybrid systems found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
D-14.06.02L	demonstrate knowledge of procedures to install water mist and hybrid systems
a.	identify tools and equipment used to install water mist and hybrid systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing water mist and hybrid systems
c.	describe procedures to lay out and install water mist and hybrid systems and **components**
d.	identify system controls for water mist and hybrid systems and their **installation requirements**
e.	explain requirements for drainage of water mist and hybrid systems
f.	describe procedures to verify operation of equipment and **components**
g.	identify requirements for pressure testing of water mist and hybrid systems, and describe associated procedures
D-14.06.03L	demonstrate knowledge of regulatory requirements for lay out and install water mist and hybrid systems and **components**
a.	identify codes, standards and regulations for laying out and installing water mist and hybrid systems and **components**

Range of Variables (include, but not limited to)

components: positive displacement pumps, relief valves, detection devices and nozzles, nitrogen cylinders, water tanks

types of water mist and hybrid systems: single fluid, twin fluid, high pressure, medium pressure, low pressure

installation requirements: materials, supports and hangers, system actuation, testing, manufacturers' specifications/training, handling and storage

D-14.07 Installs standpipe and hose systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.07.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-14.07.02P	determine and measure locations of piping and **valves**	locations of piping and **valves** are determined and measured to allow for accessibility according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.07.03P	determine requirements and measure locations of **components**	requirements and locations of **components** are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.07.04P	determine and measure fire hose valve locations	fire hose valve locations are determined and measured according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.07.05P	install fire hose valves	fire hose valves are installed with thread pattern that is compatible with AHJ
D-14.07.06P	install pressure reducing devices	pressure reducing devices are installed to limit pressure according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.07.07P	install stand-alone standpipe, combination standpipe and hose systems	stand-alone standpipe, combination standpipe and hose systems are installed according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
D-14.07.08P	install temporary standpipe and hose systems	temporary standpipe and hose systems are installed to ensure fire protection during construction, according to drawings, project specifications, site conditions, AHJ, and codes, standards and regulations
D-14.07.09P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-14.07.10P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

valves: pressure reducing valves, pressure restricting valves, control valves, fire hose valves, check valves, alarm valves, preaction/deluge valves, dry valves

components: fire department connections, drains, control valves, regulated air supply, QODs, auxiliary drains, supervisory devices, pressure gauges, fire hose valves, pressure regulating devices, hoses

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.07.01L	demonstrate knowledge of standpipe and hose systems, their **components**, characteristics, applications and operation
a.	identify **types of standpipe and hose systems**, and describe their characteristics and applications
b.	identify **classes of standpipe and hose systems**, and describe their characteristics and applications
c.	identify **factors to consider** and requirements to determine standpipe and hose system design
d.	identify types of hoses, hose valves and associated fittings, and describe their characteristics and applications
e.	identify types of hose cabinets and hose stations
f.	identify types of hose spray nozzles, and describe their applications
g.	describe operating principles of standpipe and hose systems
h.	interpret information about standpipe and hose systems found on drawings and specifications
D-14.07.02L	demonstrate knowledge of procedures to install standpipe and hose systems
a.	identify tools and equipment used to install standpipe and hose systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing standpipe and hose systems
c.	describe procedures to lay out and install standpipe and hose systems
d.	describe procedures to install hose cabinets and stations, and associated equipment
e.	describe procedures to install hose spray nozzles
f.	describe procedures to verify operation of equipment and **components**
g.	identify requirements for pressure testing of standpipe and hose systems and describe associated procedures
D-14.07.03L	demonstrate knowledge of regulatory requirements for installing standpipe and hose systems
a.	identify codes, standards and regulations for installing standpipe and hose systems
b.	identify codes, standards and regulations for flushing connections in piping systems

Range of Variables (include, but not limited to)

components: fire department connections, drains, control valves, regulated air supply, QODs, auxiliary drains, supervisory devices, pressure gauges, hose valves, pressure regulating devices, hoses

types of standpipe and hose systems: wet pipe, dry pipe, manual, automatic, combined, semi-automatic dry

classes of standpipe and hose systems: class I, class II, class III

factors to consider: pipe sizing; flow rate; pressures; hose valve location; hose thread connection; AHJ; gauge location; codes, standards and regulations

D-14.08 Modifies existing systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-14.08.01P	select and use tools and equipment	tools and equipment are selected and used according to task
D-14.08.02P	determine, measure and document **modifications** and additions to existing system	**modifications** and additions to existing system are determined, measured and documented according to drawings, specifications, site conditions, and codes, standards and regulations
D-14.08.03P	verify condition of **components** and requirements for reuse or replacement	**components** are verified to be in acceptable condition for reconditioning or reuse according to site conditions, codes, standards and specifications
D-14.08.04P	coordinate system impairments and restoration	system shutdown and restoration for tie-ins are coordinated with owner or their representative to minimize impairments to system according to project specifications, codes and standards

Reference Code	Performance Criteria	Evidence of Attainment
D-14.08.05P	remove **components** from abandoned systems	**components** and their parts from systems that are no longer in service and abandoned are removed according to standards, specifications and site conditions
D-14.08.06P	identify and revamp pipe systems	pipe schedule systems and hydraulically calculated systems are identified and revamped according to drawings, codes, standards and specifications
D-14.08.07P	identify, isolate and drain system	system is identified, isolated and drained for **modifications** using **drainage methods**
D-14.08.08P	perform pressure tests	pressure tests are performed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

modifications: removing components, replacing components, relocating components, adding components

components: sprinklers, hose valves, hoses, alarm valves

drainage methods: appropriate system drains, hose with isolation valves, containers or drums, buckets, siphoning vacuum systems

Knowledge

Reference Code	Learning Outcomes and Objectives
D-14.08.01L	demonstrate knowledge of **modifications** to existing systems and their **components**
a.	identify types of existing system **modifications**, and describe their characteristics and applications
b.	identify system **components** that are acceptable to reuse or recondition
c.	identify sprinklers that can be reused in existing system **modifications**

Reference Code	Learning Outcomes and Objectives
D-14.08.02L	demonstrate knowledge of procedures to perform existing system **modifications**
a.	identify tools, equipment and PPE to perform existing system **modifications**
b.	identify workplace hazards, and describe safe work practices for performing existing system **modifications**
c.	describe procedures to perform existing system **modifications**
d.	describe procedures to coordinate impairment and restoration
e.	describe procedures to remove system from service for the purpose of abandonment
f.	describe procedures to test system additions and revamping
g.	identify hydraulic performance impact of retrofitting cross-connection assemblies on existing systems
D-14.08.03L	demonstrate knowledge of regulatory requirements for performing existing system **modifications**
a.	identify codes standards and regulations for performing existing system **modifications**
D-14.08.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection when dealing with used water discharge and drainage
b.	identify practices that contribute to net-zero and carbon neutral commitments with reuse, reconditioning or recycling components

Range of Variables (include, but not limited to)

components: sprinklers, hose valves, hoses, alarm valves

modifications: removing components, replacing components, relocating components, adding components

Task D-15 Installs specialty fire suppression systems and equipment

Task Descriptor

Specialty fire suppression systems are designed to extinguish a fire rather than control it. They have a finite supply of extinguishing agent and must be refilled after activation. These systems require proficiency in reading and interpreting engineered drawings, schematics and technical manuals.

D-15.01 Installs dry and wet chemical, clean agent and carbon dioxide systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-15.01.01P	select pipe and fittings	pipe and fittings are selected according to **manufacturers' specifications**, and codes, standards and regulations
D-15.01.02P	select and use tools and equipment	tools and equipment are selected and used according to task
D-15.01.03P	remove possible obstructions	possible obstructions are removed in pipe by reaming, cleaning and blowing out
D-15.01.04P	install hangers, bracing, supports and restraints	hangers, bracing, supports and restraints are installed to prevent pipe movement during discharge of extinguishing agent according to codes, standards and regulations
D-15.01.05P	measure and fabricate piping	piping is measured and fabricated to meet site conditions
D-15.01.06P	measure and modify system piping	system piping is measured and modified according to **manufacturers' specifications** and site conditions

Reference Code	Performance Criteria	Evidence of Attainment
D-15.01.07P	install piping and nozzles	piping and nozzles are installed according to drawings and specifications to ensure equal discharge, and according to **manufacturers' specifications**, application, and codes, standards and regulations
D-15.01.08P	install and secure storage cylinders	storage cylinders are installed and secured to ensure safety due to high pressure of cylinders, according to **manufacturers' specifications**, and codes, standards and regulations
D-15.01.09P	install actuation devices	actuation devices are installed according to **manufacturers' specifications**, and codes, standards and regulations
D-15.01.10P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations
D-15.01.11P	assist in verification	control and actuator integration with other building services are verified with qualified personnel
D-15.01.12P	install **signage and identification**	**signage and identification** are installed according to AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

manufacturers' specifications: extra heavy fittings, pipe size, seamless pipe

components: for carbon dioxide system (alarms and indicators, life safety provisions, discharge nozzles, piping and fittings, supports, tanks and manifolds, release mechanisms, detection devices); for clean agent system (alarms and indicators, life safety provisions, discharge nozzles, piping and fittings, supports, tanks and manifolds, release mechanisms, detection devices, pressure relief venting)

signage and identification: data plates, component identification, drain list

Knowledge

Reference Code	Learning Outcomes and Objectives
D-15.01.01L	demonstrate knowledge of wet and dry chemical, clean agent and carbon dioxide systems, their **components**, characteristics, applications and operation
a.	identify types of wet and dry chemical, clean agent and carbon dioxide systems, and describe their characteristics and applications
b.	describe **fixed pipe systems**
c.	identify **components** of wet and dry chemical, clean agent and carbon dioxide systems, and describe their purpose and operation
d.	explain properties of carbon dioxide and inert gases
e.	identify extinguishing properties of wet and dry chemical, clean agent and carbon dioxide systems
f.	identify factors to consider and limitations for halon systems
g.	identify types of pipe used for specialty fire suppression systems
h.	identify clean agent system media and their properties
i.	identify containment requirements for clean agent systems and carbon dioxide systems
j.	define limited extinguishing ability of clean agent and carbon dioxide systems
k.	identify **applications** of clean agent and carbon dioxide systems
l.	describe operating principles of wet and dry chemical, clean agent and carbon dioxide systems
m.	interpret information about wet and dry chemical, clean agent and carbon dioxide systems found on drawings and specifications
D-15.01.02L	demonstrate knowledge of procedures to install wet and dry chemical, clean agent and carbon dioxide systems
a.	identify tools and equipment used to install wet and dry chemical, clean agent and carbon dioxide systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing wet and dry chemical, clean agent and carbon dioxide systems
c.	describe procedures to install wet and dry chemical, clean agent and carbon dioxide systems
d.	describe procedures to calculate quantity of carbon dioxide extinguishing agent required for system
e.	identify installation requirements for wet and dry chemical, clean agent and carbon dioxide systems and **components**

Reference Code	Learning Outcomes and Objectives
D-15.01.03L	demonstrate knowledge of testing of wet and dry chemical, clean agent and carbon dioxide systems
a.	describe procedures to test wet and dry chemical, clean agent and carbon dioxide systems
b.	identify requirements of acceptance testing of wet and dry chemical, clean agent and carbon dioxide systems
c.	describe procedures to verify operation of equipment and their **components**
D-15.01.04L	demonstrate knowledge of procedures to service, maintain and remove wet and dry chemical, clean agent and carbon dioxide systems
a.	describe procedures to service, maintain and remove wet and dry chemical, clean agent and carbon dioxide systems
D-15.01.05L	demonstrate knowledge of regulatory requirements for wet and dry chemical, clean agent and carbon dioxide systems
a.	identify codes, standards and regulations for installing wet and dry chemical, clean agent and carbon dioxide systems
b.	explain liabilities and responsibilities for testing wet and dry chemical, clean agent and carbon dioxide systems
D-15.01.06L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection
b.	describe procedures to dispose of and recycle wet and dry chemical, clean agent and carbon dioxide systems

Range of Variables (include, but not limited to)

components: for carbon dioxide system (alarms and indicators, life safety provisions, discharge nozzles, piping and fittings, supports, tanks and manifolds, release mechanisms, detection devices); for clean agent system (alarms and indicators, life safety provisions, discharge nozzles, piping and fittings, supports, tanks and manifolds, release mechanisms, detection devices, pressure relief venting)

fixed pipe systems: total flooding, local application

applications: server rooms, archival storage, libraries, manufacturing facilities

D-15.02 Installs portable extinguishers

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-15.02.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
D-15.02.02P	determine type and location of extinguisher	type and location of extinguisher is determined according to application, drawings, specifications and AHJ
D-15.02.03P	install extinguisher and cabinets or brackets	extinguisher and cabinets or brackets are installed according to drawings, specifications, AHJ, and codes, standards, regulations
D-15.02.04P	confirm that extinguisher is in operable condition	extinguisher is confirmed to be in operable condition, with full charge, pins and seals in place along with a currently dated inspection tag, which is stamped by qualified personnel
D-15.02.05P	install signage and identification	signage and identification are installed according to AHJ, and codes, standards, and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
D-15.02.01L	demonstrate knowledge of portable fire extinguishers, their components, characteristics, applications and operation
a.	identify classes and **types of portable fire extinguishers**, and describe their characteristics and applications
b.	identify components of portable fire extinguishers, and describe their characteristics and applications
c.	describe operating principles of portable fire extinguishers
d.	interpret information about portable fire extinguishers found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
D-15.02.02L	demonstrate knowledge of installation requirements and procedures to install portable fire extinguishers
a.	identify tools and equipment used to install portable fire extinguishers, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing portable fire extinguishers
c.	describe installation requirements and procedures to install portable fire extinguishers
d.	identify **installation locations** for portable fire extinguishers
D-15.02.03L	demonstrate knowledge of regulatory requirements for portable fire extinguishers
a.	identify codes, standards and regulations for portable fire extinguishers
b.	explain liabilities and responsibilities for installation of portable fire extinguishers
D-15.02.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection

Range of Variables (include, but not limited to)

types of portable fire extinguishers: wet and dry chemical, carbon dioxide, water-based, clean agent, dry powder

installation locations: cabinet, wall mount, wheeled, vehicle mount

Task D-16 Installs detection devices

Task Descriptor

These devices detect a fire situation and initiate a response of the fire protection system. The installation of electrical detection systems is performed by sprinkler fitters in some jurisdictions.

D-16.01 Installs wet and dry pilot lines

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-16.01.01P	identify pilot line and pilot line detector	pilot line and pilot line detectors are identified according to temperature requirements for wet and dry pilot lines
D-16.01.02P	select and use tools and equipment	tools and equipment are selected and used according to task
D-16.01.03P	install pilot lines	pilot lines are installed according to **parameters**
D-16.01.04P	space pilot line and fixed temperature HADs	pilot line and fixed temperature HADs are spaced according to manufacturers' specifications, and codes, standards and regulations
D-16.01.05P	connect pilot lines	pilot lines are connected to valve trim according to manufacturers' specifications
D-16.01.06P	ensure operation of equipment and components	equipment and components operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

parameters: proximity to sprinklers on fire protection piping, heat collection and ceiling structure, spacing of pilot line detectors, sizing and installation methods

Knowledge

Reference Code	Learning Outcomes and Objectives
D-16.01.01L	demonstrate knowledge of wet and dry pilot lines, their associated pilot line detectors, characteristics, applications and operation
a.	identify types of wet and dry pilot lines and their associated pilot line detectors, and describe their characteristics and applications
b.	describe operating principles of wet and dry pilot lines and their associated pilot line detectors
c.	interpret information about wet and dry pilot lines and their associated pilot line detectors found on drawings and specifications
D-16.01.02L	demonstrate knowledge of procedures to install and verify operation of wet and dry pilot lines and their associated pilot line detectors
a.	identify tools and equipment used to install and verify operation of wet and dry pilot lines and their associated pilot line detectors, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing and verifying operation of wet and dry pilot lines and their associated pilot line detectors
c.	describe procedures to install wet and dry pilot lines and their associated pilot line detectors
d.	describe procedures to pressure test wet and dry pilot lines
e.	describe procedures to verify operation of wet and dry pilot lines and their associated pilot line detectors
D-16.01.03L	demonstrate knowledge of regulatory requirements for wet and dry pilot lines and their associated pilot line detectors
a.	identify codes, standards and regulations for wet and dry pilot lines and their associated pilot line detectors

D-16.02 Installs heat-actuated devices (HADs)

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-16.02.01P	determine location of **HADs**	location of **HADs** is determined according to manufacturers' specifications and AHJ
D-16.02.02P	select and use tools and equipment	tools and equipment are selected and used according to task
D-16.02.03P	mount releasing panel	releasing panel is mounted in proximity to releasing devices to facilitate actuation of system
D-16.02.04P	install piping, tubing, wire and **HADs**	piping, tubing, wire and **HADs** are installed in area being protected according to manufacturers' specifications, AHJ, and codes, standards and regulations
D-16.02.05P	attach linear heat detection wire	linear heat detection wire is attached according to manufacturers' specifications
D-16.02.06P	ensure operation of equipment and components	equipment and components operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

HADs: fixed temperature, rate of rise detectors, linear heat detectors

Knowledge

Reference Code	Learning Outcomes and Objectives
D-16.02.01L	demonstrate knowledge of **HADs**, their components, characteristics, applications and operation
a.	identify types of **HADs**, and describe their characteristics, **parameters** and applications
b.	describe operating principles of **HADs**
c.	interpret information about **HADs** found on drawings and specifications
D-16.02.02L	demonstrate knowledge of procedures to install **HADs**
a.	identify tools and equipment used to install **HADs**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing **HADs**
c.	describe procedures to install **HADs**
d.	describe procedures to verify operation of equipment and components
e.	identify requirements for testing **HADs** and components, and describe associated procedures
D-16.02.03L	demonstrate knowledge of regulatory requirements for **HADs**
a.	identify codes, standards and regulations for **HADs**

Range of Variables (include, but not limited to)

HADs: fixed temperature, rate of rise detectors, linear heat detectors
parameters: spacing, temperature, type

D-16.03 Installs spark detection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-16.03.01P	determine location of system	location of system is determined according to manufacturers' specifications, site conditions, AHJ, and codes, standards, and regulations

Reference Code	Performance Criteria	Evidence of Attainment
D-16.03.02P	identify type of **spark detection system**	type of **spark detection system** is identified according to codes, standards and regulations
D-16.03.03P	select and use tools and equipment	tools and equipment are selected and used according to task
D-16.03.04P	fasten **spark detector system** to structure	**spark detector system** is fastened to structure to ensure detection of sparks and flame, and to prevent movement according to manufacturers' specifications
D-16.03.05P	assemble system **components**	system **components** are assembled according to manufacturers' specifications, AHJ, and codes, standards and regulations
D-16.03.06P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

spark detection systems: infrared, ultraviolet, thermal imaging cameras
components: solenoids, spark detectors

Knowledge

Reference Code	Learning Outcomes and Objectives
D-16.03.01L	demonstrate knowledge of **spark detection systems**, their **components**, characteristics, applications and operation
a.	identify types of **spark detection systems** and **components**, and describe their characteristics and applications
b.	describe operating principles of **spark detection systems** and their **components**
c.	interpret information about **spark detection systems** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
D-16.03.02L	demonstrate knowledge of procedures to install and verify operation of **spark detection systems**
a.	identify tools and equipment used to install and verify operation of **spark detection systems**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing and verifying operation of **spark detection systems**
c.	describe procedures to install **spark detection systems**
d.	describe procedures to verify operation of equipment and **components**
e.	identify requirements for pressure testing **spark detection systems** and **components**, and describe associated procedures
D-16.03.03L	demonstrate knowledge of regulatory requirements for **spark detection systems**
a.	identify codes, standards and regulations for **spark detection systems**

Range of Variables (include, but not limited to)

spark detection systems: infrared, ultraviolet, thermal imaging cameras
components: solenoids, spark detectors

D-16.04 Installs air sampling systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-16.04.01P	determine location of system	location of system is determined according to drawings, site conditions and manufacturers' specifications
D-16.04.02P	select and use tools and equipment	tools and equipment are selected and used according to task
D-16.04.03P	connect **components**	**components** of air sampling systems are connected according to manufacturers' specifications and AHJ

Reference Code	Performance Criteria	Evidence of Attainment
D-16.04.04P	install air sampling pipe	air sampling pipe is installed to detect particulate concentration in area of application according to manufacturers' specifications and AHJ
D-16.04.05P	connect and terminate air sampling system	air sampling system is connected to, and terminated from sampling/activation panel according to manufacturers' specifications and AHJ
D16.04.06P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: sampling/activation panels, tubing, sampling point, air aspirating device

Knowledge

Reference Code	Learning Outcomes and Objectives
D-16.04.01L	demonstrate knowledge of air sampling systems, their **components**, characteristics, applications and operation
a.	identify types of air sampling systems and **components**, and describe their characteristics, parameters and applications
b.	describe operating principles of air sampling systems
c.	interpret information about air sampling systems found on drawings and specifications
D-16.04.02L	demonstrate knowledge of procedures to install air sampling systems
a.	identify tools and equipment used to install air sampling systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing air sampling systems
c.	describe procedures to install air sampling systems
d.	describe procedures to verify operation of equipment and **components**
e.	identify requirements for pressure testing air sampling systems and **components**, and describe their associated procedures

Reference Code	Learning Outcomes and Objectives
D-16.04.03L	demonstrate knowledge of regulatory requirements for air sampling systems
a.	identify codes, standards and regulations for air sampling systems

Range of Variables (include, but not limited to)

components: sampling/activation panels, tubing, sampling point, air aspirating device

D-16.05 Installs electrical detection systems NOT COMMON CORE

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-16.05.01P	select and use tools and equipment	tools and equipment are selected and used according to task
D-16.05.02P	install smoke, heat and flame detectors	smoke, heat and flame detectors are installed according to job and site requirements, manufacturers' specifications and AHJ
D-16.05.03P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: smoke detectors, heat detectors, flame detectors, releasing panels

Knowledge

Reference Code	Learning Outcomes and Objectives
D-16.05.01L	demonstrate knowledge of electrical detection systems, their **components**, characteristics, applications and operation
a.	identify **types of electrical detection systems** and **components**, and describe their characteristics and applications
b.	describe operating principles of electrical detection systems
c.	interpret information about electrical detection systems found on drawings and specifications
D-16.05.02L	demonstrate knowledge of procedures to install and verify operation of electrical detection systems
a.	identify tools and equipment used to install and verify operation of electrical detection systems, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing and verifying operation of electrical detection systems
c.	describe procedures to install electrical detection systems
d.	describe procedures to verify operation of equipment and **components**
e.	identify requirements for testing electrical detection systems and **components**, and describe their associated procedures
D-16.05.03L	demonstrate knowledge of regulatory requirements for electrical detection systems
a.	identify codes, standards and regulations for electrical detection systems

Range of Variables (include, but not limited to)

components: smoke detectors, heat detectors, flame detectors, releasing panels
types of electrical detection systems: single zone, cross zone, addressable, conventional

Task D-17 Installs signal-initiating devices

Task Descriptor

Sprinkler fitters install signal-initiating devices to provide notification of system status. Alarm-initiating devices provide signals to local, proprietary or central station alarms, which warn of actuation of a fire protection system. Supervisory initiating devices monitor systems for normal system status and provide signals when outside of set ranges.

D-17.01 Installs alarm-initiating devices

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-17.01.01P	select and use tools and equipment	tools and equipment are selected and used according to task
D-17.01.02P	select and install alarm-initiating device	alarm-initiating device is selected and installed according to pipe size, system type and location to allow for replacement and repair according to site conditions, manufacturers' specifications and AHJ
D-17.01.03P	determine location of alarm-initiating devices	location of alarm-initiating devices is determined according to drawings, manufacturers' specifications, and codes, standards and regulations
D-17.01.04P	attach alarm-initiating devices to piping	alarm-initiating devices are attached to piping using **methods** according to manufacturers' specifications
D-17.01.05P	install means of **testing**	means of **testing** is installed according to manufacturers' specifications, AHJ, and codes, standards and regulations
D-17.01.06P	verify operation of alarm-initiating devices	alarm-initiating devices are field tested and adjusted according to manufacturers' specifications, AHJ, and codes, standards, and regulations

Range of Variables (include, but not limited to)

methods: threaded connections, clamps
testing: test and drain valve or an alarm test valve, inspectors' test connection

Knowledge

Reference Code	Learning Outcomes and Objectives
D-17.01.01L	demonstrate knowledge of alarm-initiating devices, their components, characteristics, applications and operation
a.	identify **types of alarm-initiating devices**, and describe their characteristics and applications
b.	describe operating principles of alarm-initiating devices
c.	interpret information about alarm-initiating devices found on drawings and specifications
D-17.01.02L	demonstrate knowledge of procedures to install and verify operation of alarm-initiating devices
a.	identify tools and equipment used to install and verify operation of alarm-initiating devices, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing and verifying operation of alarm-initiating devices
c.	identify installation locations for alarm-initiating devices
d.	describe procedures to install alarm-initiating devices
e.	describe procedures to verify operation of alarm-initiating devices
D-17.01.03L	demonstrate knowledge of regulatory requirements for alarm-initiating devices
a.	identify codes, standards and regulations for alarm-initiating devices
D-17.01.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify practices that contribute to environmental protection

Range of Variables (include, but not limited to)

types of alarm-initiating devices: paddle-type flow switches, pressure switches

D-17.02 Installs supervisory-initiating devices

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
D-17.02.01P	select supervisory-initiating device	supervisory-initiating device is selected according to components being supervised, system type and location
D-17.02.02P	determine location of supervisory-initiating devices	location of supervisory-initiating devices is determined according to drawings, site conditions and manufacturers' specifications
D-17.02.03P	select and use tools and equipment	tools and equipment are selected and used according to task
D-17.02.04P	attach supervisory-initiating devices	supervisory-initiating devices are attached to piping and components according to manufacturers' specifications, site conditions and AHJ
D-17.02.05P	verify operation of supervisory-initiating devices	supervisory-initiating devices are field tested and adjusted according to manufacturers' specifications, site conditions, AHJ, and codes, standards and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
D-17.02.01L	demonstrate knowledge of supervisory-initiating devices, their components, characteristics, applications and operation
a.	identify **types of supervisory-initiating devices**, and describe their characteristics and applications
b.	describe operating principles of supervisory-initiating devices
c.	interpret information about supervisory-initiating devices found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
D-17.02.02L	demonstrate knowledge of procedures to install and verify operation of supervisory-initiating devices
a.	identify tools and equipment used to install and verify operation of supervisory-initiating devices, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for installing and verifying operation of supervisory-initiating devices
c.	describe procedures to install supervisory-initiating devices
d.	describe procedures to verify operation of supervisory-initiating devices
D-17.02.03L	demonstrate knowledge of regulatory requirements for supervisory-initiating devices
a.	identify codes, standards and regulations for supervisory-initiating devices

Range of Variables (include, but not limited to)

type of supervisory-initiating devices: low air pressure, low water pressure, tamper (switches)

Major Work Activity E—Inspects, tests and maintains (ITM) fire protection systems

Task E-18 Inspects and tests water-based fire protection systems

Task Descriptor

Frequent inspection and testing of water-based fire protection systems is vital to ensure that these systems work within their required parameters and extends the system longevity. This is essential in the protection of life and property. These inspections and tests are conducted as per manufacturer's specifications, AHJ requirements, and codes, standards and regulations.

E-18.01 Performs scheduled inspections of water-based fire protection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-18.01.01P	refer to inspection schedule requirements	inspection schedule requirements are referred to according to AHJ, and codes, standards and regulations
E-18.01.02P	notify owner or their representative	owner or their representative is notified of scheduled inspection
E-18.01.03P	select and use inspection documents	inspection documents are selected and used according to owner or their representative's instructions, company policies, AHJ, and codes, standards and regulations
E-18.01.04P	select and use tools and equipment	tools and equipment are selected and used according to task

Reference Code	Performance Criteria	Evidence of Attainment
E-18.01.05P	identify and document abnormalities and deficiencies	abnormalities and deficiencies are identified and documented by performing visual inspections, referring to previous reports, and according to manufacturers' specifications, AHJ, and codes, standards and regulations
E-18.01.06P	identify and document interior piping **obstructions**	piping **obstructions** are identified and documented by opening system piping and examining interior conditions for **obstructions** according to manufacturers' specifications, AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

obstructions: debris, sediment, scale, rocks, foreign material, aquatic life, cut-out discs

Knowledge

Reference Code	Learning Outcomes and Objectives
E-18.01.01L	demonstrate knowledge of water-based fire protection systems, their **components**, characteristics, applications and operation
a.	identify types of water-based fire protection systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of water-based fire protection systems and their **components**
c.	interpret information about water-based fire protection systems and their **components** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
E-18.01.02L	demonstrate knowledge of procedures to inspect water-based fire protection systems and their **components**
a.	identify tools and equipment used to inspect water-based fire protection systems and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for inspecting water-based fire protection systems and their **components**
c.	describe procedures to inspect water-based fire protection systems and their **components**
d.	identify frequency of inspection of water-based fire protection systems and **components**
e.	identify common causes of water-based fire protection system failures
f.	describe procedures to inspect fire pump units and components
g.	describe procedures to inspect hydrants and fire department connections for operation and drainage
h.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
i.	identify requirements for inspecting backflow preventers
E-18.01.03L	demonstrate knowledge of regulatory requirements for inspection of water-based fire protection systems and their **components**
a.	identify codes, standards and regulations for inspection of water-based fire protection systems and their **components**
b.	explain liabilities and responsibilities for inspecting water-based fire protection systems

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

E-18.02 Performs scheduled tests of water-based fire protection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-18.02.01P	refer to testing schedule requirements	testing schedule requirements are referred to according to AHJ, and codes, standards and regulations
E-18.02.02P	notify owner or their representative	owner or their representative is notified of scheduled test and completion of work
E-18.02.03P	select and use **tools and equipment**	**tools and equipment** are selected and used according to task
E-18.02.04P	confirm water-based fire protection system is disabled and isolated	water-based fire protection system is disabled and isolated with approval of owner or their representative, and according to AHJ
E-18.02.05P	perform required tests	required tests are performed on water-based fire protection system components to ensure that they work within established parameters
E-18.02.06P	complete documentation	documentation is completed according to manufacturers' specifications, owner or their representative and company requirements, AHJ, and codes, standards and regulations

Range of Variables (include, but not limited to)

tools and equipment: pitot gauges, refractometers, tachometers, calibrated pressure gauges, diffusers, flowmeters, backflow test kits, multimeters, stopwatch, scope, scanners, testing apparatus (to simulate fire conditions)

Knowledge

Reference Code	Learning Outcomes and Objectives
E-18.02.01L	demonstrate knowledge of water-based fire protection systems, their **components**, characteristics, applications and operation
a.	identify types of water-based fire protection systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of water-based fire protection systems and their **components**
c.	interpret information about water-based fire protection systems and their **components** found on drawings and specifications
E-18.02.02L	demonstrate knowledge of procedures to test water-based fire protection systems and their **components**
a.	identify **tools and equipment** used to test water-based fire protection systems and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for testing water-based fire protection systems and their **components**
c.	describe procedures to test water-based fire protection systems and their **components**
d.	identify frequency of testing of water-based fire protection systems and **components**
e.	identify requirements for testing water-based fire protection systems that have been modified or repaired
f.	identify testing requirements for signalling devices
g.	describe procedures to shut down and reactivate water-based fire protection systems, and associated alarms and supervisory devices
h.	describe procedures to test fire pump units and **components**
i.	describe procedures to test hydrants and fire department connections for operation and drainage
j.	describe procedures to test backflow prevention devices
k.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
E-18.02.03L	demonstrate knowledge of relationship between water-based fire protection systems and fire panels
a.	identify types of fire panels and **signals**, and describe their operation and purpose
b.	describe operation of **release devices**

Reference Code	Learning Outcomes and Objectives
E-18.02.04L	demonstrate knowledge of regulatory requirements for water-based fire protection systems and their **components**
a.	identify codes, standards and regulations for water-based fire protection systems and their **components**
b.	explain liabilities and responsibilities for testing of water-based fire protection systems
E-18.02.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify **practices that contribute to environmental protection** during testing procedures
b.	describe procedures to handle and dispose of water-based fire protection system materials

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents

tools and equipment: pitot gauges, refractometers, tachometers, calibrated pressure gauges, diffusers, flowmeters, backflow test kits, multimeters, stopwatch, scope, scanners, testing apparatus (to simulate fire conditions)

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

signals: fire alarms, supervisory, trouble, water flow

release devices: solenoid valves, pneumatic actuators, hydraulic pilot detection systems, manual releases

practices that contribute to environmental protection: de-chlorination of discharged water used for testing, disposal of fire protection materials

Task E-19 Maintains and repairs water-based fire protection systems

Task Descriptor

Sprinkler fitters perform maintenance and repairs on all types of water-based fire protection systems to mitigate potential malfunctions or failures, and to keep the system and components in full operating state.

E-19.01 Troubleshoots water-based fire protection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-19.01.01P	identify potential deficiency and location	deficiency and location is identified by examining fire alarm panel, speaking with owner or their representative, and performing visual inspection and testing for abnormalities
E-19.01.02P	determine probable cause	symptoms of malfunction are identified and analyzed within location of deficiency to determine probable cause
E-19.01.03P	determine required corrective action	required corrective action is determined to reinstate system's integrity and operation
E-19.01.04P	inform owner or their representative of findings and recommendations	findings and recommendations resulting from troubleshooting are communicated to owner or their representative
E-19.01.05P	select and use tools and equipment	tools and equipment are selected and used according to task

Knowledge

Reference Code	Learning Outcomes and Objectives
E-19.01.01L	demonstrate knowledge of water-based fire protection systems, their **components**, characteristics, applications and operation
a.	identify types of water-based fire protection systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of water-based fire protection systems and their **components**
c.	interpret information about water-based fire protection systems and their **components** found on drawings and specifications
E-19.01.02L	demonstrate knowledge of procedures to troubleshoot water-based fire protection systems and their **components**
a.	identify tools and equipment used to troubleshoot water-based fire protection systems and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for troubleshooting water-based fire protection systems and their **components**
c.	describe procedures to troubleshoot water-based fire protection systems and their **components**
d.	identify common causes of water-based fire protection system deficiencies and failures
e.	identify testing and troubleshooting methods for signalling devices
f.	describe procedures to shut down and reactivate water-based fire protection systems, and associated alarms and supervisory devices
g.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
E-19.01.03L	demonstrate knowledge of relationship between water-based fire protection systems and fire panels
a.	identify types of fire panels and **signals**, and describe their operation and purpose
b.	describe operation of **release devices**
E-19.01.04L	demonstrate knowledge of regulatory requirements for troubleshooting water-based fire protection systems and their **components**
a.	explain liabilities and responsibilities for troubleshooting water-based fire protection systems

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents, drivers (high-voltage maintenance only by licensed electrician), controllers (high-voltage maintenance only by licensed electrician)

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

types of fire panels: alarm, release, annunciator

signals: fire alarms, supervisory, trouble, water flow

release devices: solenoid valves, pneumatic actuators, hydraulic pilot detection systems, manual releases

E-19.02 Repairs deficiencies of water-based fire protection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-19.02.01P	notify owner or their representative	owner or their representative is notified to access system to prevent false fire service responses, and upon completion of work
E-19.02.02P	confirm water-based fire protection system is disabled and isolated	water-based fire protection system is disabled and isolated with approval of owner or their representative, and according to AHJ
E-19.02.03P	select and use tools and equipment	tools and equipment are selected and used according to task
E-19.02.04P	verify and repair or replace deficient **components**	deficient **components** are verified and repaired or replaced based on nature of problem and according to manufacturers' specifications, AHJ, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
E-19.02.05P	take **corrective actions**	**corrective actions** are taken to return system to normal operational status
E-19.02.06P	ensure operation of equipment and **components**	equipment and **components** operate according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents, drivers (high-voltage maintenance only by licensed electrician), controllers (high-voltage maintenance only by licensed electrician)

corrective actions: replacing, adjusting and resetting devices and components; filling and recharging systems; isolating and draining systems; resetting fire alarm systems

Knowledge

Reference Code	Learning Outcomes and Objectives
E-19.02.01L	demonstrate knowledge of water-based fire protection systems, their **components**, characteristics, applications and operation
a.	identify types of water-based fire protection systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of water-based fire protection systems and their **components**
c.	interpret information about water-based fire protection systems and their **components** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
E-19.02.02L	demonstrate knowledge of procedures to repair water-based fire protection systems and their **components**
a.	identify tools and equipment used to repair water-based fire protection systems and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for repairing water-based fire protection systems and their **components**
c.	describe procedures to repair water-based fire protection systems and their **components**
d.	identify testing requirements for signalling devices
e.	describe procedures to shut down and reactivate water-based fire protection systems, and associated alarms and supervisory devices
f.	describe procedures to repair fire pump units and **components**
g.	describe procedures to repair hydrants and fire department connections
h.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
i.	describe procedures to inspect and test repaired water-based fire protection systems and their **components**
j.	describe procedures to verify operation of equipment and their **components**
k.	identify requirements for testing water-based fire protection systems and their **components**, and describe associated procedures
E-19.02.03L	demonstrate knowledge of relationship between sprinkler systems and fire panels
a.	identify **types of fire panels** and **signals**, and describe their operation and purpose
b.	describe operation of **release devices**
E-19.02.04L	demonstrate knowledge of regulatory requirements for water-based fire protection systems and their **components**
a.	identify codes, standards and regulations for water-based fire protection systems and their **components**
b.	explain liabilities and responsibilities for repair of water-based fire protection systems and their **components**

Reference Code	Learning Outcomes and Objectives
E-19.02.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify **practices that contribute to environmental protection** during repair procedures
b.	describe procedures to dispose of and recycle water-based fire protection systems and their **components**

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents, drivers (high-voltage maintenance only by licensed electrician), controllers (high-voltage maintenance only by licensed electrician)

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

types of fire panels: alarm, release, annunciator

signals: fire alarms, supervisory, trouble, water flow

release devices: solenoid valves, pneumatic actuators, hydraulic pilot detection systems, manual releases

practices that contribute to environmental protection: de-chlorination of discharged water, disposal of fire protection materials

E-19.03 Performs scheduled maintenance of water-based fire protection systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-19.03.01P	notify owner or their representative	owner or their representative is notified to access system to prevent false fire service responses, and upon completion of work

Reference Code	Performance Criteria	Evidence of Attainment
E-19.03.02P	confirm water-based fire protection system is disabled and isolated	water-based fire protection system is disabled and isolated with approval of owner or their representative and according to AHJ
E-19.03.03P	select and use tools and equipment	tools and equipment are selected and used according to task
E-19.03.04P	perform **scheduled maintenance procedures**	**scheduled maintenance procedures** are performed according to manufacturers' specifications, task, and codes, standards and regulations
E-19.03.05P	inform owner or their representative of **scheduled maintenance procedures** to be performed	owner or their representative is informed of **scheduled maintenance procedures** to be performed

Range of Variables (include, but not limited to)

scheduled maintenance procedures: changing desiccant in air dryers; cleaning strainers; draining low points on dry, preaction and deluge systems; performing lubrication and corrosion prevention measures; performing internal inspections; verifying full range of valve motion; verifying integrity of valve; performing main drain tests

Knowledge

Reference Code	Learning Outcomes and Objectives
E-19.03.01L	demonstrate knowledge of water-based fire protection systems, their **components**, characteristics, applications and operation
a.	identify types of water-based fire protection systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of water-based fire protection systems and their **components**
c.	interpret information about water-based fire protection systems and their **components** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
E-19.03.02L	demonstrate knowledge of procedures to maintain water-based fire protection systems and their **components**
a.	identify tools and equipment used to maintain water-based fire protection systems and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for maintaining water-based fire protection systems and their **components**
c.	describe **scheduled maintenance procedures** for water-based fire protection systems and their **components**
d.	identify frequency of maintenance of water-based fire protection systems and **components**
e.	identify common causes of water-based fire protection system failures
f.	describe procedures to shut down and reactivate water-based fire protection, and associated alarms and supervisory devices
g.	describe procedures to maintain fire pump units and **components**
h.	describe procedures to maintain hydrants and fire department connections
i.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
j.	describe procedures to verify maintained water-based fire protection systems and their **components**
E-19.03.03L	demonstrate knowledge of relationship between water-based fire protection systems and fire panels
a.	identify **signals**, and describe their operation and purpose
E-19.03.04L	demonstrate knowledge of regulatory requirements for water-based fire protection systems and their **components**
a.	identify codes, standards and regulations for water-based fire protection systems and their **components**
b.	explain liabilities and responsibilities for maintenance of water-based fire protection systems and their **components**
E-19.03.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	identify **practices that contribute to environmental protection** during repair procedures

Range of Variables (include, but not limited to)

components: alarm valves, dry valves, deluge valves, preaction valves, check valves, accelerators, air compressors, nitrogen generators and cylinders, initiating devices, air maintenance devices, discharge devices, relief valves, regulators, drainage, control valves, inspector's test valves, fire department connections, low points, fire hose, racks, cabinets, hose valves, hose stations, supervisory switches, alarm switches, alarm devices, hangers, bracing, auto-vents, drivers (high-voltage maintenance only by licensed electrician), controllers (high-voltage maintenance only by licensed electrician)

scheduled maintenance procedures: changing desiccant in air dryers; cleaning strainers; draining low points on dry, preaction and deluge systems; performing lubrication and corrosion prevention measures; performing internal inspections; verifying full range of valve motion; verifying integrity of valve; performing main drain tests

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

signals: fire alarms, supervisory, trouble, water flow

practices that contribute to environmental protection: de-chlorination of discharged water, disposal of fire protection materials

Task E-20 Inspects and tests specialty fire suppression systems and equipment

Task Descriptor

Frequent inspection and testing of specialty fire suppression systems and equipment is vital to ensure that these systems work within their required parameters. This is essential in the protection of life and property.

E-20.01 Performs scheduled inspections of specialty fire suppression systems

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-20.01.01P	refer to inspection schedule requirements	inspection schedule requirements are referred to according to manufacturers' specifications, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
E-20.01.02P	notify owner or their representative	owner or their representative is notified of scheduled inspection
E-20.01.03P	select and use inspection documents	inspection documents are selected and used according to manufacturers' specifications
E-20.01.04P	select and use tools and equipment	tools and equipment are selected and used according to task
E-20.01.05P	identify **abnormalities and deficiencies**	**abnormalities and deficiencies** are identified by performing visual inspections and referring to previous reports

Range of Variables (include, but not limited to)

abnormalities and deficiencies: hose connector assembly leaks and distortions, faulty detection system, modifications to compartment that affect ability of system to extinguish a fire, failure of discharge delay, failure of audible alarms, failure of visible signals

Knowledge

Reference Code	Learning Outcomes and Objectives
E-20.01.01L	demonstrate knowledge of specialty fire suppression systems, their **components**, characteristics, applications and operation
a.	identify types of specialty fire suppression systems and their **components**, and describe their characteristics and applications
b.	describe operating principles of specialty fire suppression systems and their **components**
c.	interpret information about specialty fire suppression systems and their **components** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
E-20.01.02L	demonstrate knowledge of procedures to inspect specialty fire suppression systems and their **components**
a.	identify tools and equipment used to inspect specialty fire suppression systems and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for inspecting specialty fire suppression systems and their **components**
c.	describe procedures to inspect specialty fire suppression systems and their **components**
d.	identify frequency of inspection of specialty fire suppression systems
e.	identify common causes of specialty fire suppression system failures
f.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
E-20.01.03L	demonstrate knowledge of relationship between specialty fire suppression systems and fire panels
a.	identify **types of fire panels** and **signals**, and describe their operation and purpose
b.	describe operation of **release devices**
E-20.01.04L	demonstrate knowledge of regulatory requirements for specialty fire suppression systems and their **components**
a.	identify codes, standards and regulations for specialty fire suppression systems and their **components**
b.	explain liabilities and responsibilities for inspecting specialty fire suppression systems
E-20.01.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle specialty fire suppression systems and their **components** and materials

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switches

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

types of fire panels: alarm, releasing control

signals: trouble, supervisory, pre-discharge alarm, releasing alarm

release devices: hydraulic, pneumatic, electrical, manual

E-20.02 Performs scheduled tests of specialty fire suppression systems and equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-20.02.01P	confirm testing schedule requirements	testing schedule requirements are confirmed to according to manufacturers' specifications, and codes, standards and regulations
E-20.02.02P	notify owner or their representative	owner or their representative is notified of scheduled test and completion of work
E-20.02.03P	select and use tools and equipment	tools and equipment are selected and used according to task
E-20.02.04P	arrange for or disable and disarm specialty fire suppression system and equipment	specialty fire suppression system and equipment are disabled and disarmed with permission by owner or their representative according to AHJ
E-20.02.05P	perform required tests	required tests are performed on specialty fire suppression system and equipment to ensure that they work within parameters established by manufacturers' and engineers' specifications
E-20.02.06P	complete applicable documentation	documentation is completed according to manufacturers' specifications, company policies, AHJ, and codes, standards and regulations

Knowledge

Reference Code	Learning Outcomes and Objectives
E-20.02.01L	demonstrate knowledge of specialty fire suppression systems and equipment, their **components**, characteristics, applications and operation
a.	identify types of specialty fire suppression systems and equipment, their **components**, and describe their characteristics and applications
b.	describe operating principles of specialty fire suppression systems and equipment and their **components**
c.	interpret information about specialty fire suppression systems and equipment and their **components** found on drawings and specifications
E-20.02.02L	demonstrate knowledge of procedures to test specialty fire suppression systems and equipment and their **components**
a.	identify **tools and equipment** used to test specialty fire suppression system and equipment and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe **safe work practices** for testing specialty fire suppression systems and equipment and their **components**
c.	describe procedures to test specialty fire suppression systems and equipment and their **components**
d.	identify frequency of testing of specialty fire suppression systems and equipment
e.	identify requirements for testing specialty fire suppression systems and equipment that have been modified or repaired
f.	identify testing requirements for signalling devices
g.	describe procedures to shut down and reactivate associated alarms and supervisory devices for specialty fire suppression systems and equipment
h.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
E-20.02.03L	demonstrate knowledge of relationship between fire suppression systems and fire panels
a.	identify **types of fire panels** and **signals**, and describe their operation and purpose
E-20.02.04L	demonstrate knowledge of regulatory requirements for specialty fire suppression system and equipment
a.	identify codes, standards and regulations for specialty fire suppression system and equipment
b.	explain liabilities and responsibilities for testing of specialty fire suppression systems and equipment

Reference Code	Learning Outcomes and Objectives
E-20.02.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle specialty fire suppression system and equipment and their **components**

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switches

tools and equipment: calibrated pressure gauges, multimeters, room integrity testing equipment, scales, testing apparatus (to simulate fire conditions)

safe work practices: using self-contained breathing apparatus (SCBA), using atmospheric analyzers, ensuring required ventilation, following confined space protocols, visually checking if system is grounded to prevent static discharge, de-energizing equipment, locking out and tagging out equipment, setting up warning and instruction signage, decontaminating tools and PPE

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

types of panels: alarm, releasing control

signals: trouble, supervisory, pre-discharge alarm, releasing alarm

E-20.03 Performs scheduled inspections of portable fire extinguishers

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-20.03.01P	select and use tools and equipment	tools and equipment are selected and used according to task and manufacturers' specifications
E-20.03.02P	perform visual inspection of condition of **components**	visual inspection is performed to ensure that **components** are in place, secured and free from physical damage
E-20.03.03P	verify that hoses and nozzles are intact	hoses and nozzles are intact and clear of obstructions

Reference Code	Performance Criteria	Evidence of Attainment
E-20.03.04P	verify that required maintenance and hydrostatic tests are up-to-date	visual verification of prior maintenance and testing dates is documented
E-20.03.05P	verify gauge pressure and cylinder weight	gauge pressure and cylinder weight is verified to ensure it is within acceptable operating parameters
E-20.03.06P	determine type and location of fire extinguishers	type and location of fire extinguishers match hazards of area
E-20.03.07P	document inspection	inspection is documented on equipment tags according to company policies, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: pins, nozzles, tank shells, gauges, brackets/cabinets, hoses

Knowledge

Reference Code	Learning Outcomes and Objectives
E-20.03.01L	demonstrate knowledge of portable fire extinguishers, their **components**, characteristics, applications and operation
a.	identify **classes** and **types of portable fire extinguishers**, and describe their characteristics and applications
b.	describe operating principles of portable fire extinguishers
c.	interpret information about portable fire extinguishers found on drawings and specifications
E-20.03.02L	demonstrate knowledge of procedures to inspect portable fire extinguishers
a.	identify tools and equipment used to test portable fire extinguishers, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for inspecting portable fire extinguishers and their **components**
c.	describe procedures to inspect portable fire extinguishers
d.	identify **components** of portable fire extinguishers
e.	explain liabilities and responsibilities for inspection of portable fire extinguishers
f.	identify frequency of inspection of portable fire extinguishers

Reference Code	Learning Outcomes and Objectives
E-20.03.03L	demonstrate knowledge of regulatory requirements for inspecting portable fire extinguishers
a.	identify codes, standards and regulations for inspecting portable fire extinguishers
E-20.03.04L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle portable fire extinguishers

Range of Variables (include, but not limited to)

components: pins, nozzles, tank shells, gauges, brackets/cabinets, hoses

classes (of portable fire extinguishers): A (ordinary combustibles), B (flammable liquids), C (electrical), D (combustible metals), F (oils and fats), K (commercial cooking equipment)

types of portable fire extinguishers: water, foam, CO_2, clean agent, dry and wet chemical

Task E-21 Maintains and repairs specialty fire suppression systems and equipment

Task Descriptor

Sprinkler fitters perform maintenance and repairs on all types of specialty fire suppression systems according to manufacturers' specifications to mitigate potential malfunctions or failures. Maintenance is performed on a regular schedule to ensure equipment is in full operating condition, and can be expected to operate in this condition until the next inspection.

E-21.01 Troubleshoots specialty fire suppression systems and equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-21.01.01P	identify potential problems	problem is located by examining control release panel, speaking with owner or their representative, and performing visual inspection for abnormalities
E-21.01.02P	determine probable cause	conditions of malfunction are identified and analyzed in problem area to determine probable cause
E-21.01.03P	determine required corrective action	required corrective action is determined to reinstate system's integrity and operation according to manufacturers' and engineers' specifications
E-21.01.04P	inform owner or their representative of findings and recommendations	findings and recommendations resulting from troubleshooting are communicated to owner or their representative
E-21.01.05P	select and use tools and equipment	tools and equipment are selected and used according to task

Knowledge

Reference Code	Learning Outcomes and Objectives
E-21.01.01L	demonstrate knowledge of specialty fire suppression systems and equipment, their **components**, characteristics, applications and operation
a.	identify types of specialty fire suppression systems and equipment and their **components**, and describe their characteristics and applications
b.	describe operating principles of specialty fire suppression systems and equipment and their **components**
c.	interpret information about specialty fire suppression systems and equipment and their **components** found on drawings and specifications
E-21.01.02L	demonstrate knowledge of procedures to troubleshoot specialty fire suppression systems and equipment and their **components**
a.	identify tools and equipment used to troubleshoot specialty fire suppression systems and equipment and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe **safe work practices** for troubleshooting specialty fire suppression systems and equipment
c.	describe procedures to troubleshoot specialty fire suppression systems and equipment
d.	explain liabilities and responsibilities for troubleshooting specialty fire suppression systems and equipment
e.	identify common causes of specialty fire suppression system and equipment failures
f.	identify testing and troubleshooting methods for signalling and actuation devices
g.	describe procedures to shut down and reactivate specialty fire suppression systems, and associated alarms and supervisory devices
h.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
i.	describe procedures to verify operational status of system after troubleshooting
E-21.01.03L	demonstrate knowledge of relationship between specialty fire suppression systems and fire panels
a.	identify **types of fire panels** and **signals**, and describe their operation and purpose
b.	describe operation of actuation devices

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switches

safe work practices: using SCBA, using atmospheric analyzers, ensuring required ventilation, following confined space protocols, visually checking if system is grounded to prevent static discharge, de-energizing equipment, locking out and tagging out equipment, setting up warning and instruction signage, decontaminating tools and PPE

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

types of fire panels: alarm, releasing control

signals: trouble, supervisory, pre-discharge alarm, releasing alarm

E-21.02 Repairs deficiencies of specialty fire suppression systems and equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-21.02.01P	notify owner or their representative	owner or their representative is notified to prevent false fire service responses and upon completion of work
E-21.02.02P	arrange for or disable and disarm specialty fire suppression system and equipment	specialty fire suppression system and equipment are disabled and disarmed with permission by owner or their representative according to AHJ
E-21.02.03P	select and use tools and equipment	tools and equipment are selected and used according to task
E-21.02.04P	repair or replace deficient **components**	deficient **components** are repaired or replaced based on nature of problem according to manufacturers' specifications

Reference Code	Performance Criteria	Evidence of Attainment
E-21.02.05P	take **corrective actions**	**corrective actions** are taken to return system to normal operational status according to manufacturers' specifications
E-21.02.06P	verify repair	repair is verified by performing functional test of valves and system according to manufacturers' specifications, and codes, standards and regulations

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switches

corrective actions: adjusting and replacing devices and components, filling and recharging systems

Knowledge

Reference Code	Learning Outcomes and Objectives
E-21.02.01L	demonstrate knowledge of specialty fire suppression systems and equipment, their **components**, characteristics, applications and operation
a.	identify types of specialty fire suppression systems and equipment and their **components**, and describe their characteristics and applications
b.	describe operating principles of specialty fire suppression systems and equipment and their **components**
c.	interpret information about specialty fire suppression systems and equipment and their **components** found on drawings and specifications

Reference Code	Learning Outcomes and Objectives
E-21.02.02L	demonstrate knowledge of procedures to repair specialty fire suppression systems and equipment and their **components**
a.	identify tools and equipment used to repair specialty fire suppression system and equipment and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for repairing specialty fire suppression systems and equipment and their **components**
c.	describe procedures to repair specialty fire suppression systems and equipment and their **components**
d.	explain liabilities and responsibilities for repair of specialty fire suppression systems and equipment
e.	identify testing requirements for signalling devices
f.	describe procedures to shut down and reactivate specialty fire suppression systems and equipment, and associated alarms and supervisory devices
g.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements
h.	describe procedures to perform functional test of repaired specialty fire suppression systems and equipment and their **components**
E-21.02.03L	demonstrate knowledge of relationship between specialty fire suppression systems and fire panels
a.	identify **types of fire panels** and **signals**, and describe their operation and purpose
b.	describe operation of actuation devices
E-21.02.04L	demonstrate knowledge of regulatory requirements for specialty fire suppression systems and equipment
a.	identify codes, standards and regulations for specialty fire suppression systems and equipment
E-21.02.05L	demonstrate knowledge of sustainability and environmental stewardship practices
a.	describe procedures to dispose of and recycle specialty fire suppression systems and equipment and their **components**

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switches

corrective actions: adjusting and replacing devices and components, filling and recharging systems

types of impairments and deficiencies: preplanned, emergency, critical, noncritical

types of fire panels: alarm, releasing control

signals: trouble, supervisory, pre-discharge alarm, releasing alarm

E-21.03 Performs scheduled maintenance of specialty fire suppression systems and equipment

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

Skills

Reference Code	Performance Criteria	Evidence of Attainment
E-21.03.01P	refer to maintenance schedule requirements	maintenance schedule requirements are referred to according to manufacturers' specifications, and codes, standards and regulations
E-21.03.02P	notify owner or their representative	owner or their representative is notified to prevent false fire service responses and upon completion of work
E-21.03.03P	arrange for or disable and disarm specialty fire suppression system and equipment	specialty fire suppression system and equipment are disabled and disarmed with permission by owner or their representative according to AHJ
E-21.03.04P	select and use tools and equipment	tools and equipment are selected and used according to task
E-21.03.05P	perform **scheduled maintenance procedures**	**scheduled maintenance procedures** are performed according to manufacturers' specifications, task, and codes, standards and regulations

Reference Code	Performance Criteria	Evidence of Attainment
E-21.03.06P	inform owner or their representative of any deficiencies or impairments	owner or their representative is informed of any deficiencies or impairments

Range of Variables (include, but not limited to)

scheduled maintenance procedures: checking system operation, checking for hazards or modifications to compartment, checking time delays, checking audible alarms, checking visible signals, checking for installation of warning signs

Knowledge

Reference Code	Learning Outcomes and Objectives
E-21.03.01L	demonstrate knowledge of specialty fire suppression systems and equipment, their **components**, characteristics, applications and operation
a.	identify types of specialty fire suppression systems and equipment and their **components**, and describe their characteristics and applications
b.	describe operating principles of specialty fire suppression systems and equipment and their **components**
c.	interpret information about specialty fire suppression systems and equipment and their **components** found on drawings and specifications
E-21.03.02L	demonstrate knowledge of **scheduled maintenance procedures** for specialty fire suppression systems and equipment and their **components**
a.	identify tools and equipment used to maintain specialty fire suppression systems and equipment and their **components**, and describe their procedures for use
b.	identify workplace hazards, and describe safe work practices for maintaining specialty fire suppression systems and equipment and their **components**
c.	describe **scheduled maintenance procedures** for specialty fire suppression systems and equipment and their **components**
d.	explain liabilities and responsibilities for maintenance of specialty fire suppression systems and equipment
e.	identify frequency of maintenance of specialty fire suppression systems and equipment
f.	describe procedures to shut down and reactivate specialty fire suppression systems, and associated alarms and supervisory devices
g.	identify **types of impairments and deficiencies**, and explain associated recommendations and requirements

Reference Code	Learning Outcomes and Objectives
E-21.03.03L	demonstrate knowledge of relationship between specialty fire suppression systems and fire panels
a.	identify **types of fire panels** and **signals**, and describe their operation and purpose
b.	describe operation of actuation devices
E-21.03.04L	demonstrate knowledge of regulatory requirements for specialty fire suppression system and equipment
a.	identify codes, standards and regulations for specialty fire suppression system and equipment

Range of Variables (include, but not limited to)

components: cylinders, valves, release units, electrical actuators, solenoids, gauges, actuation hoses, manifold check valves, manifolds, master selector valves, selector valves, lockout valves, abort switches, discharge nozzles, cylinder racking, bleeder valves, relief valves, pressure switches, emergency manual pull, process shutdown switches

scheduled maintenance procedures: checking system operation, checking for modifications to compartment or hazard, checking time delays, checking audible alarms, checking visible signals, checking for installation of warning signs

types of impairments and deficiencies: preplanned, emergency, critical, hidden, noncritical

types of fire panels: alarm, control, releasing control

signals: trouble, supervisory, pre-discharge alarm, alert alarm, releasing alarm

Appendix A—Acronyms

AHJ	authority having jurisdiction
BIM	Building Information Modelling
CAD	computer-assisted design
CAN/ULC	Canadian Underwriter Laboratories of Canada Standard
CCUS	carbon capture, utilization and storage
CMMS	computerized maintenance management system
CMSA	control mode specific application
CNZEAA	Canadian Net-Zero Emissions Accountability Act
CPVC	chlorinated polyvinyl chloride
CSA	Canadian Standards Association
DCVA	double check valve assembly
EAP	employee assistance plan
ESFR	early suppression fast response
ESRF	embankment-supported rubberized fabric
FLRA	field level risk assessment
FM	Factory Mutual
HA	hazard assessments,
HAD	heat-actuated device
HVAC	heating, ventilation, and air conditioning
ITM	inspection, testing and maintenance
LEED	Leadership in Energy and Environmental Design
MAPP	methylacetylene-propadiene propane
NBC	National Building Code
NECB	National Energy Code of Canada for Buildings
NFC	National Fire Code
NFPA	National Fire Protection Association
NPT	National Pipe Thread
NST	National Standard Thread
OHS	Occupational Health and Safety
OS&Y	outside stem & yoke
PEX	cross-linked polyethylene
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PIV	post indicator valve

PPE	personal protective equipment
PSI	pre-safety inspection
PVC	polyvinyl chloride
QOD	quick opening device
RNG	recover natural gas
RP (RPBA)	reduced pressure backflow assembly
SCBA	self-contained breathing apparatus
SDS	safety data sheets
SI	International System of Units
SIN	sprinkler identification number
TDG	transportation of dangerous goods
ULC	Underwriters Laboratories of Canada
VOCs	volatile organic compounds
WHMIS (GHS)	Workplace Hazardous Materials Information System (Globally Harmonized System of Classification and Labelling of Chemicals)
ZCB	Zero Carbon Building
ZEV	zero-emission vehicles

Appendix B—Tools and Equipment / Outils et équipement

Hand Tools / Outils manuels

adjustable wrenches (various sizes)	clés à ouverture réglable (de tailles diverses)
bench vice	étau d’établi
benders (pipe and tube)	cintreuses (pour tuyaux et tubes)
bevelling tool	outil de biseautage
caulking gun	pistolet à calfeutrer
centre finder/contour marker	centreur
centre punch	pointeau centreur
cold chisels (various sizes)	ciseaux à froid (de tailles diverses)
combination wrenches (metric and imperial)	clés mixtes (métriques et impériales)
crimping tools	sertisseurs
cutters (pipe and tube)	coupe-tuyaux et coupe-tubes
die and chasers	filière et peignes à fileter
drop-in anchor setting tool	outil d’ancrage à impact
drywall saw	scie passe-partout
extension cord	rallonge électrique
files (flat, half-round, rat-tail, bastard)	limes (plates, demi-ronde, queue de rat, bâtarde)
fitting brushes	brosses pour raccords
flaring tool	évaseur
flashlight	lampe de poche
gasket cutter	coupe-garniture
grease gun	pistolet graisseur
hacksaw	scie à métaux
hammers (ball-peen, claw, sledge)	marteaux (à panne ronde, à panne fendue, masse)
hand saw	scie à main
head wrench	clé pour tête d’extincteur
hex wrenches (metric and imperial)	clés hexagonales (métriques et impériales)
hose wrench	clé à boyaux
levels	niveaux
line-up bars	barres d’alignement

manual in place groover	rainureuse à main pour les utilisations sur le chantier
markers	traceurs de contour
nipple chuck	retenue filetée
oilers	burettes à huile
paint brushes	pinceaux
pick	pic
pipe stand	porte-tuyaux
pipe wrench	clé à tuyaux
pliers (needle nose, locking, slip joint, side cutting)	pinces (à becs pointus, étaux, à manchon coulissant, coupantes de côté)
plumb bob	fil à plomb
pry bar (goose neck, wrecking, pinch)	levier (à col de cygne, de démolition, de pincement)
ratchet cutters	coupe-tuyaux à rochet
ratchet dies	filières à cliquet
rod cutters	coupe-tiges
rod dies	filières à boulons
scissors	ciseaux
scrapers (various sizes)	grattoirs (de tailles diverses)
screwdrivers (flat, Phillips, Robertson, various sizes)	tournevis (plat, cruciforme, à pointe carrée, de tailles diverses)
snips (heavy duty sheet metal cutting)	cisailles (pour tôles épaisses)
socket sets (metric and imperial)	jeux de douilles (métriques et impériales)
strap/chain wrench	clé à sangle
tripod vice	trépied
trowels (concrete and pointer)	truelles (à béton et à joint)
utility knives	couteaux universels
wire brush	brosse d’acier
wire cutter	coupe-fil

Portable and Stationary Power Tools / Outils mécaniques portatifs

air monitoring device	dispositif de surveillance de l’air
chop saw	scie à tronçonner
compressor	compresseur
concrete cutting machine	machine à couper le béton
coring machine core driller	carotteuse
die equipment	équipement de réglage de filière

electric drills (portable magnetic base, drill press, cordless, hammer, t-drill)	perceuses électriques (portative à socle aimanté, à colonne, sans fil, à percussion, pour les raccords en T)
flushing machine (hydraulic and hydropneumatics)	appareil à purger (hydraulique et hydropneumatique)
fusion welding machine	machine de soudage par fusion
grinders (wire brush, angle grinders)	meuleuses (brosse d’acier, meuleuses d’angle)
groover (hydraulic, cut, press and roll, portable or in-air/in-place)	rainureuse (hydraulique, par incision, par moletage, portative ou à l’air libre)
hand-held electronic tape	ruban électronique à main
heating torch	chalumeau de chauffe
hole saw	scie emporte-pièce
hydraulic bender	cintreuse hydraulique
hydraulic cutter	coupe-tuyau hydraulique
impact wrenches (electric, pneumatic and wireless)	clé à chocs (électriques, pneumatiques et sans fil)
oxy-fuel brazing torch	chalumeau d’oxybrasage
oxy-fuel cutting torch	chalumeau d’oxycoupage
pipe cutter	coupe-tuyau
pipe threaders/groovers	filières à tuyau/rainureuses
plasma cutter	découpeuse au plasma
powder actuated tools	outils à charge explosive
power bevelling tool	outil à biseauter mécanique
power vice	étau mécanique
reamer (hand-held or mounted on power threader)	alésoir (à main ou montés sur filière mécanique)
reciprocating saw	scie alternative
tamper	pilonneuse
tapping machine and attachments	machine à tarauder et accessoires
testing pump	pompe d’essai
threading machine	fileteuse
vacuum cleaner (wet/dry)	aspirateur pour déchets secs ou humides
water pump	pompe à eau
wire wheel (body grinder or angle grinder with wire brush)	meuleuse à toile métallique (meuleuse de carrosserie ou d’angle avec brosse d’acier)

Measuring and Testing Equipment / Outils de mesure et d’essai

alignment device	dispositif d'alignement

amp/volt/ohm meter	ampèremètre/voltmètre/ohmmètre
back flow test kit	trousse d’essai anti-retour
battery load tester	appareil de vérification de batterie
builder’s level	niveau de bâtisseur
calibrating gauge	calibre d’étalonnage
calipers	calibres
dial indicator	comparateur à cadran
differential pressure gauge	manomètre différentiel
diffuser	diffuseur
drafting equipment (scale ruler, compass)	matériel à dessin (règle graduée, compas)
feeler gauge	jauge d’épaisseur
flowmeter	débitmètre
heat lamp	lampe chauffante
hoses	boyaux
hydrometer	hydromètre
infrared	niveau à rayons infrarouges
laser	laser
laser level	niveau laser
laser plumb	fil à plomb laser
liquid measuring containers	contenants gradués à liquide
magnetic level	niveau magnétique
manometer	manomètre
multimeter	multimètre
pipe diameter tape	ruban diamétrique
pitot tubes	tubes de Pitot
play pipes	tuyaux de lance
pressure gauge kit	ensemble de manomètres
refractometer	réfractomètre
sight tube	tube d’observation
spirit level	niveau à bulle
square	équerre
stop watch	chronomètre
straightedge	règle droite
tachometer	tachymètre
tape measure	ruban à mesurer
temperature gauge	thermomètre

test hoses and securement	boyaux d’essai et arrimage
testing pump, excess, hydrostatic test pump	pompe d’essais, d’excès, d’essai hydrostatique
thermal camera	caméra thermique
thermometer	thermomètre
thread depth gauge (ring/plug)	calibre de filetage (bague/tampon)
torque wrench	clé dynamométrique
transit level	tachéomètre
vernier calliper	pied à coulisse
vibration sensing device	dispositif de détection des vibrations

Rigging, Hoisting and Lifting Equipment / Équipement de gréage, de montage et de levage

beam clamps	pinces à poutre
beam trolleys	chariots à poutres
block and tackle	palans à câble
cable clamps	serre-câble
cable grip	tire-câbles
chain block hoist	treuil à palan à chaîne
chain falls	palans à chaînes
chains	chaîne
come-alongs (cable or chain)	pince-câbles, palans à levier
cranes	grues
equalizer beam	balancier
fork-lift	chariot à fourche
grip hoist	treuil manuels
hoists	appareils de levage
jacks	crics
overhead hoist	palan aérien
pallet jack	transpalettes à main
pipe buggy (pipe cannon)	chargeuse de tuyaux
pipe dolly (grass hopper)	chariot à tuyaux (sauterelle)
portable booms	grues mobiles
rollers	rouleaux
rope	corde
shackles	manilles
skid steer loader	chargeur à direction à glissement

slings	élingues
snatch blocks	poulies à chape ouvrantes
softeners	protecteurs d’élingue
spreader bar	barre d’écartement
stand	base
support	dispositifs de soutien
telescopic forklift	chariot élévateur à fourche télescopique
tugger	chariot tracteur
winch	treuil
wire rope	corde métallique

Access Equipment / Équipement d’accès

articulating boom lift	nacelle élévatrice articulée
ladder (fixed, portable)	échelle (fixe, portative)
mobile elevating work platforms (MEWP)	plateformes de travail aériennes élévatrices
personnel basket	nacelle monte-personne (panier)
power-elevated work platform (PEWP)	plateforme de travail élévatrice motorisée
scaffolding	échafaudage

Electronic Equipment (General) / Équipement électronique (général)

calculator	calculatrice
cellular phone	téléphone cellulaire
computer	ordinateur
digital camera	appareil photo numérique
hand-held and stationary radios	appareil radio portatif et fixe

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

air hood	hotte
air monitoring device	dispositif de surveillance de la qualité de l’air
apron	tablier
arc flash suit	combinaison de protection contre les arcs électriques
boots	bottes
confined space entry equipment	équipement d’entrée dans les espace clos
coveralls	combinaison de travail
earplugs and earmuffs	bouchons d’oreille et cache-oreilles antibruit
eye wash stations	douches oculaires

face shield	masque facial
fall protection equipment	équipement de protection contre les chutes
fire blanket	couverture antifeu
fire extinguisher	extincteur
fire hoses	boyaux d’incendie
fire-retardant clothing	tenue de feu ignifuge
first aid kit	trousse de premiers soins
gloves	gants
goggles	lunettes de protection
hard hat	casque protecteur
high voltage rubber insulating blankets and gloves	couvertures et gants en caoutchouc isolant de haute tension
knee pads	genouillères
reflector vest	veste réfléchissante
respirators (particle, vapour)	respirateurs (particules, vapeur)
safety glasses	lunettes de sécurité
self-contained breathing apparatus (SCBA)	appareil respiratoire autonome
spill kit	trousse de lutte contre les déversements
tag- and lock-out devices	dispositifs de cadenassage et d’étiquetage
welding partition screen	écran de soudage

Appendix C—Glossary / Glossaire

accelerators	quick opening device that speeds up the response time of a dry pipe valve	accélérateurs	dispositif d’ouverture rapide qui accélère le déclenchement des clapets d’alarme sous air
air dryer	equipment used to reduce moisture content in air to reduce corrosion and blockage due to ice plugs	déshydrateur	équipement utilisé pour réduire la teneur en humidité de l'air afin de réduire la corrosion et les blocages dus aux bouchons de glace
air sampling systems	systems designed to detect fire at its earliest stages by drawing air samples from a network of pipes throughout a building and analyzing them	systèmes de prélèvement d’air	systèmes conçus pour détecter les incendies à leurs premiers stades en prélevant des échantillons d’air à partir d’un réseau de tuyaux dans le bâtiment et en les analysant
backfill	earth, soil or gravel (aggregate) used in proper placement to bury underground piping	remblai	terre, sol, ou gravier criblé (granulats) utilisés comme assises des canalisations souterraines
cathodic protection	a method of corrosion protection for metal used primarily on steel water tanks and underground piping to prevent electrolysis	protection cathodique	méthode de protection du métal contre la corrosion, utilisée principalement pour les réservoirs d'eau en acier et les tuyaux souterrains afin de prévenir l'électrolyse

combined dry pipe/preaction system	dry pipe system that employs a supplemental detection system	système mixte à préaction et sous air	système de gicleurs sous air qui utilise un système de détection supplémentaire
cross-connection control assemblies/devices	equipment used to prevent contamination of the water supply	dispositifs de prévention du raccordement croisé	équipement utilisé pour prévenir la contamination du réseau d'alimentation en eau potable
deluge system	a system with open sprinkler heads that relies on detection systems to operate, set up so that when the system is tripped all heads spray simultaneously	système de gicleurs de type déluge	réseau à gicleurs ouverts installés de sorte que tous les gicleurs se déclenchent en même temps une fois le robinet automatique de commande du débit de l'eau ouvert
dies	equipment used to cut external threads on rod or pipe	filières	outil servant à faire des filetages externes sur des tiges ou des tuyaux
dry pipe system	a sprinkler system charged with air or other approved gases, primarily used to prevent freezing in a cold environment	système sous air	système de gicleurs généralement à air comprimé ou à autre gaz approuvé utilisé là où il y a des conditions de gel
escutcheon (plate)	an aesthetic or cosmetic plate used to cover the annular space around a sprinkler that penetrates a well/ceiling	rosace	plaque esthétique ou cosmétique utilisée pour couvrir l'espace annulaire autour d'un gicleur qui pénètre dans un puits ou un plafond

excess pressure pump	water pump that boosts pressure to prevent false alarms in a wet system	pompe de surpression	pompe à eau automatique qui maintient la pression du système sous eau plus élevée que la plus haute pression d’alimentation prévue pour empêcher les fausses alarmes
fire pump unit	an assembly of components, including a wat pump, that is used to increase pressure of thew water supply to meet system demand	pompes d’incendies	ensemble de composants, y compris une pompe à eau utilisée pour augmenter la pression du réseau d’alimentation en eau afin de répondre à la demande du système
flushing connection	a connection used to flush water from above and below ground piping and components; for example, at the end of a water main or hydrant	raccord de purge	raccords permettant de purger les débris d’une tuyauterie souterraine ou au niveau du sol, comme à la fin d’une canalisation ou d’une prise d’eau
grooving (of pipe)	a process of mechanically joining pipe in which a groove is cut or pressed (rolled) around a pipe to accommodate a coupling	rainurage (d’un tuyau)	procédé de raccordement mécanique des tuyaux consistant à découper ou à rouler une rainure autour d'un tuyau afin d'y insérer un accouplement

hangers	components installed to allow pipes to be attached overhead or to other support structures	étriers de suspension de tuyaux	composants qui offrent un support en hauteur aux tuyaux ou aux autres éléments structurels
heat-actuated devices (HADs)	a device triggered when a specified temperature or rate of increasing temperature is detected	appareils aérothermiques	dispositif qui se déclenche à une température donnée ou à une élévation de température donnée
hybrid fire-extinguishing system	a fire-extinguishing system capable of delivering hybrid media at the specified design rate and proportion	système d'extinction d'incendie hybride	système d'extinction des incendies capable de diffuser des matières hybrides dans les proportions et au taux spécifiés par le concepteur
laydown	a pre-determined area where material is stored	pièce de rangement	endroit prédéterminé où le matériel est entreposé
markups / as-built drawing	a revised set of drawings submitted by a contractor upon completion of a project that reflect all changes made to the specifications and shop drawings during the construction process	dessin d’après-exécution/conforme à l’exécution	ensemble de dessins révisés soumis par le contracteur suite à l’achèvement d’un projet, et qui inclus les changements spécifiés et les dessins d’atelier effectués pendant la construction

pitch	the slope of a pipe, usually expressed as a ratio of rise (change in elevation) to run (change in distance)	pente	la pente d’un tuyau, généralement exprimée comme le rapport entre l’inclinaison (changement dans l’élévation) et la course (changement dans la distance)
preaction systems	a system that may or may not contain supervisory air or nitrogen that can be operated through detection or sprinkler activation	systèmes à préaction	système pouvant contenir ou non de l'air ou de l'azote de garde, pouvant être actionné par détection ou par l'activation des gicleurs
pressure switch	a device used for sensing or monitoring high or low pressure in piping system	interrupteur de pression	dispositif utilisé pour surveiller les hautes et basses pressions dans les réseaux de tuyaux
pump room	also called pump house. A designated area or room in a building or outside a building that contains a fire pump and its components	chambre des pompes	local à l’intérieur ou à l’extérieur d’un bâtiment qui abrite une pompe d’incendie et ses éléments
reaming	a process to restore the pipe to its original inside diameter, usually by removing the internal burr formed when the pipe was cut	alésage	opération qui consiste à redonner à un tuyau son diamètre intérieur d’origine, habituellement en enlevant les bavures internes résultant de la coupe du tuyau
seismic/sway bracing	pipe restraint system	contreventements parasismiques ou obliques	système de retenue des tuyaux

shop drawings	a drawing or set of drawings produced by the contractor, supplier, manufacturer or subcontractor for the purpose of installing, fabricating and bidding	dessins d’atelier	dessin ou ensemble de dessins faits par le contracteur, le fournisseur, le fabricant ou le sous-traitant aux fins d’installation, de fabrication et d’appels d’offres
sleeve	installed before or after concrete or other structural placement to enable pipes to pass from one area of a structure to another	manchon	dispositif installé avant ou après la mise en place des éléments en béton ou des autres éléments structurels afin de permettre le passage des tuyaux d'une zone à l'autre d'une structure
sling	any metal or synthetic flexible device used to cradle or support a load. Slings are attached to the hoist line of the lifting device to complete the lift	élingue	élément souple en métal ou en matière synthétique servant à soutenir une charge, attaché au câble de levage dans le but de lever la charge
sprinkler guards	devices used to protect heads from damage	protège-gicleurs	dispositifs servant à protéger les gicleurs afin de réduire les dommages mécaniques
standpipe system	a system to which firefighting or occupant hoses may be attached	système de canalisations	système auquel peuvent être raccordés des boyaux d'incendie

suppression systems	types include wet/dry chemical, gas, clean agent, mist, hybrid	systèmes d’extinction	systèmes à poudre chimique et à agent chimique liquide, à dioxyde de carbone, à agent propre, à eau atomisée et hybrides
tamper switch	device which monitors the tampering of a device, opening or closing of a valve by sounding a signal in fire alarm panel	interrupteur de sécurité	dispositif de déclenchement du signal de dérangement dans le panneau d’alarme incendie actionnés par l’ouverture ou la fermeture d’une soupape
thrust block	concrete restraint cast in place at critical point in underground piping installations, in order to prevent hydraulic pressure from moving or separating pipe joints	massif d’ancrage	dispositif de retenue en béton coulé sur place à l’endroit critique d’une canalisation souterraine pour empêcher la pression hydraulique de faire bouger un joint ou de le détacher
trim	smaller or auxiliary piping attached to installed devices such as valves and pumps. Often supplied as a “trim package”	garniture	petite tuyauterie ou tuyauterie auxiliaire raccordée à des dispositifs installés tels que des soupapes et des pompes. Souvent fournie sous forme d'« ensemble de garnitures ».

underground warning tape	a material placed in a trench to warn excavation crews of the existence of buried utilities	ruban d’avertissement souterrain	matériau placé dans une tranchée pour avertir les équipes d'excavation de la présence de services publics enterrés
valves	device placed in a pressurized piping system in order to control, restrict, direct or prevent the movement of chemicals, gases, liquids or other substances	soupapes	dispositif placé dans les tuyauterie afin de réguler ou diriger le mouvement des produits chimiques, des gaz, des liquides et d’autres substances
water flow alarm switch	a device that senses flow/pressure and initiates water flow alarms	régulateur de débit	dispositif qui détecte le débit et la pression ou qui surveille le débit d'eau et déclenche des alarmes de débit d'eau
water motor gong	a water-operated local audible alarm	cloche hydraulique	alarme sonore locale actionnée par l’eau
wet pipe system	sprinkler system charged with water	système de gicleurs sous eau	systèmes de gicleurs rattachés à un réseau de tuyauterie contenant de l’eau