

RED SEAL

OCCUPATIONAL

STANDARD

SPRINKLER FITTER



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FOREWORD

***The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the Red Seal standard for the 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) sponsors 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 analyses of occupations.

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

Trades and Apprenticeship Division

Apprenticeship and Regulated Occupations Directorate

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|  |  |
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This standard was prepared by the Apprenticeship and Regulated Occupations Directorate of ESDC. The coordinating, facilitating and processing of this analysis were undertaken by employees of the standards development team of the Trades and Apprenticeship Division and of the Ontario College of Trades, the host jurisdiction for this trade.

STRUCTURE OF THE OCCUPATIONAL STANDARD

To facilitate understanding of the occupation, this standard contains the following sections:

**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

**Essential Skills Summary:** an overview of how each of the nine essential skills is applied in this 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:** a graph which depicts the national percentages of exam questions assigned to the major work activities

**Task Matrix and Examination Weightings:** a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard and their respective exam weightings

**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

**Essential Skills:** the most relevant essential skills for this sub-task

**Skills**

**Performance Criteria:** description of the activities that are done as the sub-task is performed

**Evidence of Attainment:** proof that the activities of the sub-task meet the expected performance of a tradesperson who has reached journeyperson level

**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 that provide a more in-depth description of a term used in the performance criteria, evidence of attainment, learning outcomes, or learning objectives

**Appendix A – Acronyms:** a list of acronyms used in the standard with their full name

**Appendix B – Tools and Equipment:** a non-exhaustive list of tools and equipment used in this trade

**Appendix C – Glossary:** definitions or explanations of selected technical terms used in the standard

DESCRIPTION OF THE SPRINKLER FITTER TRADE

“Sprinkler Fitter” is this trade’s official Red Seal occupational title approved by the CCDA. This analysis covers tasks performed by sprinkler fitters whose occupational title has been identified by some provinces and territories of Canada under the following names:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NL | NS | PE | NB | QC | ON | MB | SK | AB | BC | NT | YT | NU |
| Pipefitter - Fire Protection Mechanic Specialty (Construction) |  |  |  |  | **✓** |  |  |  |  |  |  |  |  |
| Sprinkler and Fire Protection Installer |  |  |  |  |  | **✓** |  |  |  |  |  |  |  |
| Sprinkler System Fitter | **✓** | **✓** | **✓** | **✓** |  |  | **✓** | **✓** |  | **✓** | **✓** | **✓** | **✓** |
| Sprinkler Systems Fitter |  |  |  |  |  |  |  |  | **✓** |  |  |  |  |

Sprinkler fitters lay out, install, repair, maintain, modify, inspect and test fire protection systems in a variety of buildings and settings. They work on fire protection systems such as wet, dry, water mist, preaction, foam, deluge, standpipe, clean agent, carbon dioxide, hybrid, antifreeze, and wet and dry chemical fire suppression system. Their duties include reading and interpreting engineered drawings, installing hangers and clamps to support the piping system, preparing the pipe, joining pipe using a variety of methods, installing associated equipment including cross-connection control, as well as maintaining, inspecting and testing all types of fire protection systems.

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 personal care homes. They may work for trade contractors, maintenance departments of factories, and servicing companies. They may also be self-employed. Sprinkler fitters may specialize in installation, maintenance, testing or inspection.

Sprinkler fitters use tools and equipment such as hand tools, portable and stationary power tools, measuring and testing equipment, 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. Sprinkler fitters frequently work on the same site more than once and routinely perform a variety of tasks covering all aspects of the trade. They are frequently 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, noise and dust.

Key attributes for persons 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 foreman, estimators, contractors, inspection personnel and instructors. They also act as mentors and trainers of apprentices in the trade.

TRENDS IN THE  
SPRINKLER FITTER TRADE

***Installation Environments***

There is a demand for residential sprinkler systems due to increased life safety awareness and insurance requirements. This will continue to expand work outside the typical industrial, commercial and institutional (ICI) sectors. This necessitates more communication with non-tradespeople and end users.

Increasing concerns regarding the protection of life and property has resulted in new, more stringent legislation regarding installation, maintenance, inspection and testing of fire protection systems. These new requirements increase the need for building retrofits.

***Safety and Environmental Considerations***

Safety has become more important in the workplace. Compliance with safety regulations and practices is mandatory, and non-compliance is met with severe penalties for workers, employers and contractors.

Water usage is a growing consideration for the trade, and the trade needs to be cognizant of this during testing, retrofitting and installation.

***Technology and Code***

The advances in technology and changes to code require sprinkler fitters to upgrade their skills and knowledge to adapt to the increased complexity of fire protection systems and to seek access to manufacturer specific training. For example, wet sprinkler systems that use early suppression fast response (ESFR) and control mode specific application (CMSA) technology are increasing in use because they provide more cost-efficient fire control and allow the elimination of in-rack sprinkler systems in storage occupancies. Specialty fire protection systems, including hybrid and clean agent systems, are becoming more common in areas with sensitive electronic equipment such as office areas and server/network rooms.

Components such as small valve stations and riser manifolds are being manufactured with the option of pre-assembly. There are new specialized sprinklers available; more models deal with specific applications.

Due to authority having jurisdiction (AHJ) requirements and advances in technology, devices require more frequent and scheduled maintenance, inspection and testing to ensure proper operation of fire protection systems.

***Tools and Equipment***

Use of tools such as laser levels, laser plumbs and cordless tools is increasing in the trade. Due to the complexity of the trade and more frequent testing, there is an increase in the variety of diagnostic equipment. Digital technology such as smart phones and tablets are more common and assist with ongoing learning, communication and record keeping.

ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

* understand how essential skills are used in the trades;
* learn about individual essential skills strengths and areas for improvement; and
* improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: <https://www.canada.ca/en/employment-social-development/programs/essential-skills/tools.html>

The application of these skills may be described throughout this document within the competency statements which support each subtask of the trade. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at <http://www.red-seal.ca/>.

READING

Sprinkler fitters read texts such as short descriptions and directions on labels for products. They read bulletins, manuals, work orders, reports and procedures when installing, operating, diagnosing, maintaining, inspecting and repairing equipment. They also read emails 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 applicable codes such as National Fire Protection Association (NFPA) and National Building Code (NBC).They may interpret graphs when monitoring equipment operation. They interpret or review schematics and engineered drawings of systems (pneumatic, mechanical, electrical, structural and hydraulic) to identify malfunctions. Sprinkler fitters may also retrieve and study data from scale 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, 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 supervisors and co-workers about ongoing work, and suppliers about equipment specifications. They also write incident reports and update drawings as required.

ORAL COMMUNICATION

Sprinkler fitters talk to suppliers, engineers, contractors, co-workers, supervisors, other tradespersons and clients and members of the public about equipment specifications, access, orders, and delivery and service times. They discuss work orders, equipment malfunctions and job task coordination with co-workers. 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 of equipment. Calculations are required in multiple aspects of the sprinkler fitter trade, such as pneumatic, mechanical, structural and hydraulic systems. They calculate distances, totals, maximums, minimums, tolerances, fits and quantities required. They may calculate loads, 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 to determine service requirements.

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 building information modelling (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.

WORKING WITH OTHERS

Sprinkler fitters are required to work independently, with other sprinkler fitters, other tradespeople and personnel from other departments and jurisdictional organizations depending on the scope of the work.

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 exchanging information with co-workers and suppliers.

INDUSTRY EXPECTED PERFORMANCE

All tasks must be performed according to the applicable jurisdictional codes and standards. All health and safety standards must be respected and observed. Work should be done efficiently and at a high quality without material waste or environmental damage. All requirements of the manufacturer, client specifications, the National Fire Protection Association (NFPA), Underwriter Laboratories of Canada (ULC), Factory Mutual (FM), National Building Code (NBC), fire codes and AHJ must be met. At a journeyperson level of performance, all tasks must be done with minimal direction and supervision. As a journeyperson progresses in their career there is an expectation that they continue to upgrade their skills and knowledge to keep pace with industry and promote continuous learning in their trade through mentoring of apprentices.

LANGUAGE REQUIREMENTS

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

PIE CHART

OF RED SEAL EXAMINATION

WEIGHTINGS

|  |  |  |
| --- | --- | --- |
| MWA A | Performs common occupational skills | 20% |
| MWA B | Installs water supply | 15% |
| MWA C | Installs piping | 28% |
| MWA D | Installs and lays out fire protection systems and devices | 21% |
| MWA E | Installs, 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. Interprovincial examinations for this trade typically have 120 questions.

SPRINKLER FITTER

TASK MATRIX

|  |  |
| --- | --- |
| A - PERFORMS COMMON OCCUPATIONAL SKILLS | 20% |

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| --- | --- | --- | --- | --- |
| Task A-1 Performs safety-related functions  23% |  | A-1.01 Maintains safe work environment | A-1.02 Uses personal protective equipment (PPE) and safety equipment | A-1.03 Performs lock-out and tag-out procedures |
|  |  | A-1.04 Performs work in confined space |  |  |
| Task A-2 Uses and maintains tools and equipment  26% |  | A-2.01 Uses hand tools | A-2.02 Uses portable and stationary power tools | A-2.03 Uses measuring and testing equipment |
|  |  | A-2.04 Uses access equipment | A-2.05 Uses rigging, hoisting and lifting equipment | A-2.06 Uses soldering and brazing equipment |
| Task A-3 Organizes work  25% |  | A-3.01 Interprets codes, standards, regulations and procedures | A-3.02 Uses drawings and specifications | 3.03 Uses documentation and reference material |
|  |  | A-3.04 Plans job tasks and procedures | A-3.05 Prepares work site | A-3.06 Performs layout of systems |
| Task A-4 Commission systems  18% |  | A-4.01 Commissions water supply systems | A-4.02 Commissions fire protection systems |  |
| Task A-5 Uses communication and mentoring techniques  8% |  | A-5.01 Uses communication techniques | A-5.02 Uses mentoring techniques |  |

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| B - Installs water supply | 15% |

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| Task B-6 Installs underground water supplies  18% |  | B-6.01 Supervises trenching and backfilling (NOT COMMON CORE) | B-6.02 Installs underground piping and components (NOT COMMON CORE) | B-6.03 Flushes underground system |
| Task B-7 Installs fire pump units  38% |  | B-7.01 Determines location of pumps, drivers, controllers and components | B-7.02 Installs pumps, drivers, controllers and components |  |
| Task B-8 Installs fire department connections  26% |  | B-8.01 Determines location, size and type of fire department connections | B-8.02 Installs fire department connection piping and components |  |
| Task B-9 Installs private water supply systems  18% |  | B-9.01 Installs water tanks | B-9.02 Installs related equipment |  |

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| C - Installs piping | 28% |

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| Task C-10 Prepares pipe, tube and fittings for installation  27% |  | C-10.01 Cuts pipe and tube | C-10.02 Bends pipe and tube | C-10.03 Threads pipe |
|  |  | C-10.04 Grooves pipe | C-10.05 Drills pipe and tube | C-10.06 Grinds pipe |
|  |  | C-10.07 Prepares fittings |  |  |
| Task C-11 Installs pipe, tube and fittings  37% |  | C-11.01 Installs steel pipe, tube and fittings | C-11.02 Installs plastic pipe, tube and fittings | C-11.03 Installs copper pipe, tube and fittings |
|  |  | C-11.04 Paints and labels pipe and tube |  |  |
| Task C-12 Installs piping components  36% |  | C-12.01 Selects sprinklers | C-12.02 Installs sprinklers and nozzles | C-12.03 Installs sleeves |
|  |  | C-12.04 Installs supports and hangers | C-12.05 Installs seismicprotection | C-12.06 Installs cross-connection control assemblies |
|  |  | C-12.07 Installs system drainage |  |  |

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| D - Installs and lays out fire protection systems and devices | 21% |

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| Task D-13 Installs water-based systems  58% |  | D-13.01 Installs wet pipe systems | D-13.02 Installs dry pipe systems | D-13.03 Installs antifreeze systems |
|  |  | D-13.04 Installs preaction/deluge systems | D-13.05 Installs foam systems | D-13.06 Installs standpipe systems |
|  |  | D-13.07 Installs water mist and hybrid systems |  |
| Task D-14 Installs specialty fire suppression systems  17% |  | D-14.01 Installs dry and wet chemical, clean agent and carbon dioxide systems | D-14.02 Installs portable extinguishers |  |
| Task D-15 Installs detection devices  11% |  | D -15.01 Installs wet and dry pilot lines | D -15.02 Installs heat-actuated devices (HADs) (NOT COMMON CORE) | D -15.03 Installs spark detection systems (NOT COMMON CORE) |
|  |  | D -15.04 Installs air sampling systems (NOT COMMON CORE) | D -15.05 Installs electrical detection systems (NOT COMMON CORE) |  |
| Task D -16 Installs signal-initiating devices  14% |  | D -16.01 Installs alarm-initiating devices | D -16.02 Installs supervisory-initiating devices |  |

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| E - Inspects, tests and maintains (ITM) fire protection systems | 16% |

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| Task E-17 Maintains and repairs fire protection systems  54% |  | E -17.01 Troubleshoots fire protection systems | E -17.02 Repairs deficiencies | E -17.03 Performs scheduled maintenance |
| Task E -18 Inspects and tests fire protection systems  46% |  | E -18.01 Performs scheduled tests | E -18.02 Performs scheduled inspections | E -18.03 Inspects portable fire extinguishers |

MAJOR WORK ACTIVITY A

Performs common occupational skills

TASK A-1 Performs safety-related functions

TASK DESCRIPTOR

Safety is critical in this trade. These tasks are performed to ensure that each individual worker is working in a safe manner and those around them are also safe. Through procedures and documentation the requirements of Occupational Health and Safety (OH&S) are being met.

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| A-1.01 | Maintains safe work environment |

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| **Essential Skills** | Oral Communication, Document Use, Working with Others |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-1.01.01P | follow ***specified safety procedures*** | ***specified safety procedures*** are followed according to OH&S regulations and site-specific requirements |
| A-1.01.02P | recognize ***workplace*** ***hazards*** | ***workplace*** ***hazards*** arerecognized according to site-specific requirements |
| A-1.01.03P | maintain a clean and tidy work site | a clean and tidy work site is maintained to avoid injuries to self and others |
| A-1.01.04P | coordinate tasks | tasks with other workers are coordinated to avoid injury to self and others |
| A-1.01.05P | place flagging, pylons and signage | flagging, pylons and signage are placed when working in high-traffic areas to avoid injury to persons in the vicinity of the worksite |
| A-1.01.06P | handle hazardous materials | hazardous materials are handled according to ***Workplace Hazardous Materials Information System (WHMIS) procedures*** |
| A-1.01.07P | participate in safety meetings and discussions | safety meetings and discussions are participated in to ensure that information is recorded and distributed to all team members |
| A-1.01.08P | recognize and report unsafe conditions | unsafe conditions are recognized and reported to ensure they are mitigated |
| A-1.01.09P | complete ***safety-related documentation*** | ***safety-related documentation*** is completed and submitted according to company policy |

RANGE OF VARIABLES

***specified safety procedures*** include: fall protection, hot work, confined space, travel restraint, using personal protective equipment (PPE), following site-specific requirements

***workplace hazards*** include: systems under pressure, high voltage, rotating equipment, working at heights, working around hazardous materials, other work being performed in the area

***WHMIS procedures*** include: disposal, labelling, use of PPE

***safety-related documentation*** includes: field risk assessment, job hazard assessment, accident reports, equipment and PPE inspections, tool box talk, safety meeting minutes, WHMIS documents

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| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-1.01.01L | demonstrate knowledge of safe work practices | define terminology associated with safe work practices |
|  |  | identify ***workplace hazards*** and describe safe work practices |
| A-1.01.02L | demonstrate knowledge of regulatory requirements pertaining to safety | identify and interpret ***workplace safety and health regulations*** |

RANGE OF VARIABLES

***workplace hazards*** include: systems under pressure, high voltage, rotating equipment, working at heights, working around hazardous materials, other work being performed in the area

***workplace safety and health regulations*** include: federal (WHMIS, Transportation of Dangerous Goods [TDG]), provincial/territorial (OH&S), municipal

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

|  |  |
| --- | --- |
| **Essential Skills** | Thinking, Document Use, Continuous Learning |

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

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

RANGE OF VARIABLES

***PPE*** includes: basic PPE (hard hats, safety glasses, hearing protection, safety boots, high-visibility vests), specialized (site-specific) PPE, fall protection/travel restraints

***outdated or damaged PPE*** includes: expired hard hats, excessively worn boots, cracked safety glasses

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

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| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-1.02.01L | demonstrate knowledge of ***PPE*** and ***safety equipment***, their applications, maintenance and procedures for use | define terminology associated with ***PPE*** and ***safety equipment*** |
|  |  | identify ***workplace hazards*** and describe safe work practices and ***safety equipment*** |
|  |  | identify types of ***PPE*** and describe their applications and procedures for use |
|  |  | identify types and location ofsite ***safety equipment***, and describe their applications and procedures for use |
|  |  | describe the procedures used to inspect, maintain and store ***PPE*** and ***safety equipment*** |
| A-1.02.02L | demonstrate knowledge of regulatory requirements pertaining to safety | identify and interpret ***workplace safety and health regulations*** |

RANGE OF VARIABLES

***PPE*** includes: basic PPE (hard hats, safety glasses, hearing protection, safety boots, high-visibility vests), specialized (site-specific) PPE, fall protection/travel restraints

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

***workplace hazards*** include: personal (confined space, working at heights, lifting and ergonomics, trenches), workplace (hot work, lock-out/tag-out, 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, system drainage and disposal requirements)

***workplace safety and health regulations*** include: federal (WHMIS, TDG), provincial/territorial (OH&S), municipal

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| A-1.03 | Performs lock-out and tag-out procedures |

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| **Essential Skills** | Oral Communication, Working with Others, Thinking |

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

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| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-1.03.01P | determine lock-out/tag-out requirements for system components | requirements for lock-out/tag-out are met according to ***regulations***, local AHJ and site-specific guidelines |
| A-1.03.02P | obtain and install ***lock-out/tag-out equipment*** | ***lock-out/tag-out equipment*** is installed according to task and site-specific requirements |
| A-1.03.03P | remove designated ***lock-out/tag-out equipment*** | designated ***lock-out/tag-out equipment*** is removed according to task and site-specific requirements |

RANGE OF VARIABLES

***regulations*** include: federal, OH&S, municipal

***lock-out/tag-out equipment*** includes: lock and key, chains and tags, lock-out scissor clamp, lock-box, blanks

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-1.03.01L | demonstrate knowledge of applications and procedures for ***locking out/tagging out equipment*** | identify situations that require lock-out/tag-out |
|  |  | describe procedures for locking out/tagging out equipment and piping |

RANGE OF VARIABLES

***lock-out/tag-out equipment*** includes: lock and key, chains and tags, lock-out scissor clamp, lock-box, blanks

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| A-1.04 | Performs work in confined space |

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| **Essential Skills** | Oral Communication, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-1.04.01P | confirm if area has been classified as a ***confined space*** prior to entry | pre-job hazard assessment documentation has been completed |
| A-1.04.02P | determine if ***confined space*** is safe for entry | ***confined space*** is determined safe for entry according to OH&S and ***confined space documentation*** |
| A-1.04.03P | determine hazards within confined space | ***confined space hazards*** are identified and necessary safety equipment is implemented |

RANGE OF VARIABLES

***confined space*** includes: manholes, crawl spaces, trenches, tanks, service chases, elevator shafts, attics, vaults

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

***confined space hazards*** include: air quality, lack of accessibility, location, hazards of contents

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-1.04.01L | demonstrate knowledge of applications and procedures for working in ***confined spaces*** | identify situations that require specialty safety equipment |
|  |  | describe procedures for verification of entry permit |
|  |  | identify safety procedures associated with ***confined spaces*** |

RANGE OF VARIABLES

***confined spaces*** include: manholes, crawl spaces, trenches, tanks, service chases, elevator shafts, attics, vaults

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.

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| A-2.01 | Uses hand tools |

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| **Essential Skills** | Continuous Learning, Thinking, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-2.01.01P | inspect ***hand tools*** | ***hand tools*** are inspected for ***damage*** or excessive wear that affects function |
| A-2.01.02P | maintain ***hand tools*** | ***hand tools*** are lubricated and cleaned after use to prevent corrosion and sustain usability |
| A-2.01.03P | 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 |
| A-2.01.04P | replace ***hand tool*** ***parts*** | ***hand tool*** ***parts*** are replaced according to manufacturers' specifications and function |
| A-2.01.05P | operate ***hand tools*** | ***hand tools*** are operated according to task at hand and intended purpose |

RANGE OF VARIABLES

***hand tools*** include: see appendix B (Tools and Equipment)

***damage*** includes:dull saws and cutting blades, worn jaws on pipe wrenches, chipped cutting wheels, fractured, cracked or corroded equipment

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-2.01.01L | demonstrate knowledge of ***hand tools,*** their applications, maintenance and procedures for use | define terminology associated with ***hand tools*** |
|  |  | identify hazards and describe safe work practices pertaining to the use of ***hand tools*** |
|  |  | identify types of ***hand tools***, and describe their applications and procedures for use |

RANGE OF VARIABLES

***hand tools*** include: see appendix B (Tools and Equipment)

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| A-2.02 | Uses portable and stationary power tools |

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| **Essential Skills** | Thinking, Continuous Learning, Document Use |

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

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|  | SKILLS | |
|  | **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 |
| 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 | lubricate ***portable and stationary*** ***power*** ***tools*** | ***portable and stationary*** ***power*** ***tools*** are lubricated 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*** areset up according to manufacturers’ specifications and company policies |
| A-2.02.05P | store ***portable and stationary*** ***power*** ***tools*** | ***portable and stationary*** ***power*** ***tools*** are stored in a clean, dry and secure place to ensure they are in operating condition and easily located |

RANGE OF VARIABLES

***portable and stationary*** ***power tools*** include: see appendix B (Tools and Equipment)

***unsafe conditions*** include: missing parts, defective or missing guards, frayed cords, defective blades

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-2.02.01L | demonstrate knowledge of ***portable and stationary*** ***power tools***, their applications, maintenance and procedures for use | define terminology associated with ***portable and stationary*** ***power tools*** |
|  |  | identify hazards and describe safe work practices pertaining to ***portable and stationary*** ***power*** ***tools*** |
|  |  | identify types of ***portable and stationary*** ***power tools***, and describe their applications and procedures for use |

RANGE OF VARIABLES

***portable and stationary*** ***power tools*** include: see appendix B (Tools and Equipment)

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| A-2.03 | Uses measuring and testing equipment |

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| **Essential Skills** | Numeracy, Document Use, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-2.03.01P | verify calibration of ***equipment*** | calibration of ***equipment*** is performed 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 policy |
| 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 | store ***measuring and testing equipment*** | ***measuring and testing equipment*** is stored to prevent freezing and mechanical damage |

RANGE OF VARIABLES

***equipment*** that requires calibration includes: test gauges, cross-connection testing kits, refractometers, tachometers, flowmeters

***measuring and testing equipment*** includes: see appendix B (Tools and Equipment)

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-2.03.01L | demonstrate knowledge of ***measuring and testing equipment***, their applications, maintenance and procedures for use | define terminology associated with ***measuring and testing equipment*** |
|  |  | identify types of ***measuring and testing equipment***, and describe their applications and procedures for use |

RANGE OF VARIABLES

***measuring and testing equipment*** includes: see appendix B (Tools and Equipment)

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| A-2.04 | Uses access equipment |

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| **Essential Skills** | Document Use, Reading, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-2.04.01P | select ladders and scaffolding | ladders and scaffolding for the job are selected taking into consideration ***factors*** |
| A-2.04.02P | inspect ladders and scaffolding before use | ladders and scaffolding are inspected before use for damage and missing components, and inspection tags |
| A-2.04.03P | secure ***access equipment*** | ***access equipment*** is secured according to OH&S and job requirements |
| A-2.04.04P | erect, level and dismantle scaffolding | scaffolding is erected, levelled and dismantled according to OH&S and job requirements |
| A-2.04.05P | use ***access equipment*** | ***access equipment*** is used within operating limitations as indicated on manufacturers’ tags, literature and in compliance with governmental regulations |
| A-2.04.06P | perform safety inspection of ***power-elevated work platforms*** | documented safety inspections of ***power-elevated*** ***work platforms*** are performed prior to use |
| A-2.04.07P | select and operate ***power-elevated*** ***work platforms*** | ***power-elevated*** ***work platforms*** are selected according to ***factors,*** operated according to manufacturers’ operation manual and OH&S |
| A-2.04.08P | inspect ***power-elevated*** ***work platform*** for wear, damage or defects | ***power-elevated*** ***work platform*** is inspected for wear, damage or defects and removed from service, when necessary |

RANGE OF VARIABLES

***factors*** include: height, site conditions, task being performed

***access equipment*** includes: see appendix B (Tools and Equipment)

***power-elevated work platforms*** include: boom lifts, scissor lifts, swing stages

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-2.04.01L | demonstrate knowledge of the selection, assembly and procedures for using ***access equipment*** | define terminology associated with ***access equipment*** |
|  |  | identify hazards and describe safe work practices pertaining to the use of ***access equipment*** |
|  |  | interpret ***codes and regulations*** pertaining to the use of ***access equipment*** |
|  |  | identify types of ***access equipment***, and describe their applications |
|  |  | describe the procedures used to inspect and maintain ladders and scaffolding |
|  |  | describe the procedures used to erect, level and dismantle scaffolding |
|  |  | describe the procedures used to store and secure ***access equipment*** |

RANGE OF VARIABLES

***access equipment*** includes: see appendix B (Tools and Equipment)

***codes and regulations*** include: jurisdictional limitations, certification requirements, Canadian Standards Association (CSA), American National Standards Institute (ANSI) standards

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| A-2.05 | Uses rigging, hoisting and lifting equipment |

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| **Essential Skills** | Oral Communication, Working with Others, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-2.05.01P | select ***rigging, hoisting and lifting equipment*** | ***rigging, hoisting and lifting equipment*** is selected for task considering ***factors*** |
| A-2.05.02P | inspect ***rigging, hoisting and lifting equipment*** | ***rigging, hoisting and lifting equipment*** is inspected for wear, damage and defects before each use |
| A-2.05.03P | remove defective ***rigging, hoisting and lifting equipment*** from service | defective ***rigging, hoisting and lifting equipment*** is removed from service by ***methods*** |
| A-2.05.04P | identify ***hazards*** | ***hazards*** are identified |
| A-2.05.05P | rig loads | loads are rigged following rigging procedures to ensure safety and to prevent damage to rigging equipment and material |
| A-2.05.06P | attach and use tag lines | tag lines are attached and used to guide and position loads |
| A-2.05.07P | use basic hand signals | basic hand signals are used to communicate with equipment operators |
| A-2.05.08P | store ***rigging, hoisting and lifting equipment*** | ***rigging, hoisting and lifting equipment*** is stored in clean, dry and secure locations away from damaging conditions |

RANGE OF VARIABLES

***rigging, hoisting and lifting equipment*** includes: see appendix B (Tools and Equipment)

***factors*** include: weight, loads, distance to be travelled

***methods*** include: tag-out procedures, site-specific procedures, consulting manufacturers' specifications

and OH&S regulations

***hazards*** include: overhead obstructions, excavations, excessive loads

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-2.05.01L | demonstrate knowledge of ***rigging, hoisting and lifting equipment***, their applications, limitations and procedures for use | define terminology associated with ***rigging, hoisting and lifting equipment*** |
|  |  | identify ***hazards*** and describe safe work practices pertaining to ***rigging, hoisting and lifting equipment*** |
|  |  | identify types of ***rigging, hoisting and lifting equipment,*** and describe their applications, limitations and procedures for use |
|  |  | identify ***types of ropes and slings***, and describe their characteristics, safe working loads and applications |
|  |  | identify the ***factors to consider*** for selecting rigging equipment |
|  |  | describe the procedures used to inspect, maintain and store ***hoisting, lifting and rigging equipment*** |
|  |  | describe the procedures used for attaching rigging equipment to the load |
|  |  | explain sling angle when preparing for hoisting and lifting operations |
| A-2.05.02L | demonstrate knowledge of calculations required to perform rigging, hoisting and lifting operations | describe the ***factors to consider***, and the procedures used to perform calculations related to rigging, hoisting and lifting operations |
| A-2.05.03L | demonstrate knowledge of ***knots, bends and hitches***, their applications and procedures for tying | identify types of ***knots, bends and hitches*** used on ropes, and describe their applications and procedures to tie them |
| A-2.05.04L | demonstrate knowledge of ***communication methods*** used for hoisting and lifting | identify and interpret hand signals used for hoisting and lifting |
|  |  | describe the ***communication methods*** used during hoisting, lifting and rigging operations |
|  |  | describe the ***procedures used to ensure the work area is safe*** for lifting |
| A-2.05.05L | demonstrate knowledge of the procedures used to plan and perform rigging, hoisting and lifting operations | describe the ***procedures used to plan and perform a lift*** |

RANGE OF VARIABLES

***rigging, hoisting and lifting equipment*** includes: see appendix B (Tools and Equipment)

***hazards*** include: overhead obstructions, excavations, excessive loads

***types of ropes and slings*** include: nylon, manila,graded, wire sling

***factors to consider*** include: load characteristics, environment, safety factors

***knots, bends and hitches*** include: bowline, sheet bend, clove hitch

***communication methods*** include: hand signals, electronic communications, audible/visual

***procedures used to ensure the work area is safe*** include: supervision of lift, securing work area, communication

***procedures used to plan and perform a lift*** include: determine weight of the 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 the load, disconnect the load

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| A-2.06 | Uses soldering and brazing equipment |

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| **Essential Skills** | Thinking, Continuous Learning, Working with Others |

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

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| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-2.06.01P | obtain required permits and determine the need to disarm the fire detection system in the work area location | permits are obtained and fire detection disarming procedures are followed according to building policy |
| A-2.06.02P | select ***soldering and brazing equipment*** | ***soldering and brazing equipment*** is appropriate for applications and materials |
| A-2.06.03P | set up ***soldering and brazing equipment*** | set up is performed according to application |
| 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, flux and brazing alloy | solder, flux and brazing alloy selected meets capillary action requirements for copper alloy joints |
| A-2.06.06P | join copper alloy fittings and tubing components | minimum standards for joining copper alloy are met according to NFPA standards and standardized procedures |
| A-2.06.07P | protect equipment and flammable materials while soldering and brazing | flammable 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 in a safe and operable condition |
| A-2.06.09P | identify, tag and replace worn, damaged or defective ***soldering and brazing equipment*** | defects in ***soldering and brazing equipment*** are identified and equipment is tagged and replaced |
| 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

***soldering and brazing equipment*** includes: oxy-fuel and air-fuel torches, gas cylinders, torch heads and tips

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-2.06.01L | demonstrate knowledge of ***soldering and brazing equipment***, applications and procedures | identify types of ***soldering and brazing*** ***equipment*** |
|  |  | identify hazards and safety procedures pertaining to soldering and brazing |
|  |  | identify different soldering and brazing processes and applications |
|  |  | identify soldering and brazing ***consumables*** |
|  |  | describe soldering and brazing procedures |
|  |  | describe the procedures used to inspect, maintain and store ***soldering and brazing equipment*** |
|  |  | explain what conditions would require the disarming of the detection systems |

RANGE OF VARIABLES

***soldering and brazing equipment*** includes: oxy-fuel and air-fuel torches, gas cylinders, torch heads and tips

***consumables*** include: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.

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| A-3.01 | Interprets codes, standards, regulations and procedures |

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| **Essential Skills** | Reading, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-3.01.01P | locate code and standard sections | sections that apply to the task being performed are located |
| A-3.01.02P | use code and standard information | information is used to determine required method and to perform necessary calculations |
| A-3.01.03P | interpret tables and charts in codes and standards | tables and charts are referred to and interpreted |
| A-3.01.04P | refer to ***jurisdictional and environmental regulations*** | ***jurisdictional and environmental regulations*** are referred to according to AHJ |
| A-3.01.05P | refer to facility and equipment procedures | facility and equipment procedures are referred to for ***tasks*** |
| A-3.01.06P | refer to manufacturers’ installation instructions | manufacturers’ specifications are referred to in order to ensure equipment is installed as required |
| A-3.01.07P | adhere to ***company procedures*** | ***company procedures*** are adhered to |

RANGE OF VARIABLES

***jurisdictional and environmental regulations*** include: municipal fire standards and fire department requirements, insurance regulations

***tasks*** include: lock-out, shutdown of sprinkler system, alarm systems, management of system impairments

***company procedures*** include: service reports, safety and communication procedures

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-3.01.01L | demonstrate knowledge of trade-related codes, standards, regulations, procedures and their applications | define terminology associated with trade-related codes, standards, regulations, procedures |
|  |  | identify ***types of trade-related documents*** and describe their applications |
|  |  | explain responsibilities associated with completing and/or signing trade-related documents |
|  |  | describe the procedures used to complete trade-related documents |

RANGE OF VARIABLES

***types of trade-related documents*** include: manufacturers’ specifications, drawings, addendums, specifications, codes and standards, work orders, building and safety permits, technical bulletins, manuals, safety data sheets (SDS), safety logs, time sheets, OH&S reports, contractors’ material and test certificates, commissioning papers, equipment operating certificates

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| A-3.02 | Uses drawings and specifications |

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| **Essential Skills** | Continuous Learning, Document Use, Thinking |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-3.02.01P | refer to manufacturers’ and shop drawings | manufacturers’ and shop drawings are referred to in order to obtain ***equipment specifications*** |
| A-3.02.02P | refer to engineering specifications | engineering specifications are referred to in order to determine required equipment |
| A-3.02.03P | refer to ***drawings*** | ***drawings*** are referred to in order to identify locations of components of fire protection systems and ***possible obstructions*** |
| A-3.02.04P | interpret and scale ***drawings*** | ***drawings*** are interpreted and scaled to determine installation requirements and approximate location and dimensions of fire protection and other equipment |
| A-3.02.05P | interpret schematic drawings and pictorial diagrams | schematic drawings and pictorial diagrams are interpreted to obtain information on automatic valve assemblies, valve stations and electrical equipment |
| A-3.02.06P | create ***on-site*** ***drawings*** | ***on-site*** ***drawings*** are created to coordinate work and document work performed |

RANGE OF VARIABLES

***equipment specifications*** include: size, type of material, manufacturer and installation procedures

***drawings*** include: isometric, orthographic, 3-D

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

***on-site*** ***drawings*** include: sketches, mark-ups, as-builts

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-3.02.01L | demonstrate knowledge of sprinkler system ***drawings*** and ***on-site drawings*** | define terminology associated with reading and sketching drawings |
| A-3.02.02L | demonstrate knowledge of the procedures to read and interpret ***drawings*** and ***on-site drawings*** | explain the fundamentals of orthographic and isometric projections |
|  |  | identify ***types of lines*** found on sprinkler system drawings |
|  |  | identify symbols found on sprinkler system drawings |
|  |  | identify ***types of views*** found on sprinkler system drawings |
|  |  | describe the procedures used to interpret dimensions on drawings |
|  |  | identify ***types of scales*** and describe their characteristics and applications |
|  |  | identify drafting tools and drawing equipment, and describe their applications and procedures for use |
|  |  | describe the procedures used to interpret a site plan in both metric and imperial units |
| A-3.02.03L | demonstrate knowledge of the procedures to draw and label orthographic and isometric drawings | describe the procedures used to create orthographic and isometric drawings |
| A-3.02.04L | demonstrate knowledge of the procedures to read and interpret information pertaining to sprinkler systems found in construction drawings | identify ***divisions of drawings*** and describe their purpose |
|  |  | identify viewsand ***drawings*** of a building and describe their purpose |
|  |  | interpret sprinkler systems information found on drawings |
|  |  | describe the procedures used to interpret metric and imperial scaling |
|  |  | describe the procedures used to prepare orthographic and isometric sketches |
|  |  | describe the procedures used to prepare single line pipe drawings such as orthographic and isometric |

RANGE OF VARIABLES

***drawings*** include: isometric, orthographic, 3-D

***on-site*** ***drawings*** include: sketches, mark-ups, as-builts

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

***types of views*** include: plan, elevation, sections, details

***types of scales*** include: metric scale (S.I.), architect scale (imperial), engineer scales

***divisions of drawings*** include: architectural, structural, mechanical, electrical, plot, specifications, schedules

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| A-3.03 | Uses documentation and reference material |

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| **Essential Skills** | Document Use, Writing, Reading |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-3.03.01P | refer to technical bulletins and manuals | technical bulletins and manuals are referred to in order to obtain detailed information about equipment |
| 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 and complete ***written documents*** | ***written documents*** are maintained and completed according to contract requirements, job progress and AHJ |
| A-3.03.04P | complete and submit ***reports*** | ***reports*** are completed and submitted to keep accurate records for future reference |
| A-3.03.05P | interpret and follow change orders and site instructions | change orders and site instructions are interpreted and followed according to contract requirements and job progress |

RANGE OF VARIABLES

***written documents*** include: service requests, work orders, on-site change notices, incident reports, hot work permits, time sheets

***reports*** include: inspection, material and test sheets, verification reports, deficiency lists, company-specific reports

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-3.03.01L | demonstrate knowledge of trade-related documentation and reference material and their application | define terminology associated with trade-related documentation and reference material |
|  |  | identify ***types of trade related documentation and reference material*** and describe their applications |
|  |  | explain responsibilities associated with completing and/or signing trade-related documents |
|  |  | describe the procedures used to complete trade-related documents |

RANGE OF VARIABLES

***types of trade-related documents and reference material*** include: manufacturers’ specifications, drawings, addendums, specifications, codes and standards, work orders, building and safety permits, technical bulletins, manuals, SDS, safety logs, time sheets, OH&S reports, contractors’ material and test certificates, commissioning papers, equipment operating certificates, deficiency lists

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| A-3.04 | Plans job tasks and procedures |

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| **Essential Skills** | Thinking, Working with Others, Oral Communication |

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| yes | yes | yes | yes | NV | yes | yes | yes | yes | yes | NV | NV | NV |

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|  | SKILLS | |
|  | **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 a 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 | coordinate tasks with other ***tradespeople*** | tasks with other ***tradespeople*** arecoordinated to avoid job conflicts |
| A-3.04.06P | assign personnel to specific locations and tasks | personnel are assigned to specific locations and tasks according to scope of work |
| A-3.04.07P | arrange for use of ***specialized*** ***tools and equipment*** | use of ***specialized*** ***tools and equipment*** is arranged according to the scope of work |
| A-3.04.08P | organize tools and equipment usage | tools and equipment usage is organized according to scope of work |
| A-3.04.09P | estimate labour needs | labour needs for completion of tasks is estimated taking into consideration ***factors*** |

RANGE OF VARIABLES

***tradespeople*** include: crane operators, carpenters, plumbers, electricians, sheet metal workers, steamfitter/pipefitters

***specialized tools and equipment*** include: cranes, power-elevated work platforms, coring machines, x-ray scanners

***factors*** to consider for estimating labour needsinclude: tools and equipment, deadlines, expertise, movement of material and equipment

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-3.04.01L | demonstrate knowledge of the procedures to plan and organize jobs | define terminology associated with job planning activities |
|  |  | identify ***sources of information*** relevant to job planning |
|  |  | identify the ***factors to consider for determining job requirements*** |
|  |  | describe the procedures used to ***plan job tasks*** |
|  |  | describe the procedures used to receive and verify delivered materials |
|  |  | describe the procedures used to store, organize and maintain inventory |
|  |  | identify ***factors that affect*** ***material take-off lists***, and describe their applications and the procedures used to produce them |

RANGE OF VARIABLES

***sources of information*** include: documentation, drawings, related professionals, clients

***factors to consider for determining job requirements*** include: personnel, tools and equipment, materials, permits

***plan job tasks*** include: scheduling, estimating, coordinating site access

***factors that affect material take-off lists*** include: material estimation, material installation

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| A-3.05 | Prepares work site |

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| **Essential Skills** | Document Use, Oral Communication, Thinking |

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

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|  | SKILLS | |
|  | **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, model numbers to detect shipping damage and confirm quantity |
| 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 procedures |
| A-3.05.03P | secure ***materials and supplies*** | ***materials and supplies*** are secured using equipment such as chains, straps and slings |
| A-3.05.04P | select and use ***equipment*** | ***equipment*** is selected and used to move materials according to scope of work |
| 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*** and emergency exits | location of washrooms, ***site safety equipment*** and emergency exits are located on-site |
| A-3.05.08P | locate ***service points*** | ***service points*** are located |
| A-3.05.09P | locate ***isolation points*** | ***isolation points*** are located |

RANGE OF VARIABLES

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

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

***equipment*** includes: forklifts, power jacks, hand carts

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

***service points*** include: water, electricity

***isolation points*** include: water and electrical controls

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-3.05.01L | demonstrate knowledge of procedures to receive materials | describe the procedures used to receive and verify delivered materials |
| A-3.05.02L | demonstrate knowledge of procedures used to store, secure, organize and maintain materials | describe the procedures used to store, secure, organize and maintain inventory |
| A-3.05.03L | demonstrate knowledge of procedures used to plan for and prepare work sites | describe the ***procedures used to prepare work sites*** |
|  |  | identify location and types of ***site safety equipment*** |

RANGE OF VARIABLES

***procedures used to prepare work sites*** include: lay down, erecting barricades and flagging, identifying hazards, locating service points, locating isolation points, material take-off lists

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

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| A-3.06 | Performs layout of systems |

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| **Essential Skills** | Document Use, Numeracy, Thinking |

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

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|  | SKILLS | |
|  | **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 ***factors*** |
| A-3.06.02P | plot location of ***main lines*** and branch lines | ***main line*** and branch line locations are measured and confirmed to meet site conditions and approved drawings |
| A-3.06.03P | determine hanger locations | hanger locations are determined to ensure sprinkler lines are installed consistently in a straight line according to industry standards and site conditions |
| A-3.06.04P | use level to aid in the installation of supports and hangers | level is used to ensure pitch and straightness of lines |
| A-3.06.05P | determine location of penetrations | location of penetrations is identified according to drawings and site conditions |
| A-3.06.06P | confirm information on ***drawings*** | information on ***drawings*** concurs with and matches site conditions |
| A-3.06.07P | modify layout to accommodate ***site conditions*** | layout is modified to accommodate ***site conditions*** |

RANGE OF VARIABLES

***factors*** include: occupancy hazard, ceiling structure, type of system

***main lines*** include: feed, cross, riser

***drawings*** include: isometric, orthographic, 3-D

***site conditions*** include: ducts, structural members, lighting, obstructions

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-3.06.01L | demonstrate knowledge of sprinkler system layout | describe the procedures used to lay out ***sprinkler systems*** and ***components*** |
|  |  | identify ***site conditions*** affecting layout |

RANGE OF VARIABLES

***sprinkler systems*** include: wet pipe, dry pipe, antifreeze, stand pipe and hose, preaction/deluge, water mist, foam

***components*** include: feed mains, valves, pumps, cross mains, branch lines, risers, test connections, fittings, drains, tanks

***site conditions*** include: ducts, structural members, lighting, obstructions

TASK A-4 Commissions systems

TASK DESCRIPTOR

Commissioning is the final step in installing fire protection 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, specifications and AHJ requirements.

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| A-4.01 | Commissions water supply systems |

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| **Essential Skills** | Document Use, Numeracy, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-4.01.01P | verify that hydrostatic, chlorination and flushing tests have been completed | hydrostatic, chlorination and flushing tests have been completed on underground piping and are verified prior to connection of system components through contractor’s test and material certificate |
| A-4.01.02P | conduct acceptance test of fire pump system | acceptance test of fire pump system is conducted with manufacturer’s representative to verify operation of pump assembly |
| A-4.01.03P | verify operation of ***water supply system components*** | ***water supply system components*** are operating according to system requirements and meets minimum system design performance and criteria |
| A-4.01.04P | 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 codes and manufacturers’ specifications |
| A-4.01.05P | complete documentation | documentation has been completed according to company policies, AHJ and NFPA standards |

RANGE OF VARIABLES

***water supply system components*** include: cross-connection control assemblies, water tanks, reservoirs, fire pumps

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-4.01.01L | demonstrate knowledge of the procedures to commission water supply systems | define terminology associated with commissioning of water supply systems |
|  |  | identify workplace hazards and describe safe work practices pertaining to the commissioning of water supply systems |
|  |  | interpret codes, standards and regulations pertaining to the commissioning of water supply systems |
|  |  | interpret information pertaining to the commissioning of water supply systems found on drawings and specifications |
|  |  | identify ***tests*** to be performed on water supply systems |
|  |  | describe the procedures used to commission water supply systems |
|  |  | calculate flow rates and discharge pressures |

RANGE OF VARIABLES

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

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| A-4.02 | Commissions fire protection systems |

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| **Essential Skills** | Document Use, Numeracy, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-4.02.01P | perform hydrostatic and pneumatic tests on piping systems | hydrostatic and pneumatic tests are performed on piping and components of piping installation according to NFPA standards and manufacturers' specifications |
| A-4.02.02P | perform hydrostatic and pneumatic tests on detection systems | hydrostatic and pneumatic tests are performed on detection components according to NFPA standards |
| A-4.02.03P | 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-4.02.04P | check placement of hangers, brackets, supports and restraints | placement of hangers, brackets, supports and restraints are checked by inspecting and referring to project specifications and NFPA standards |
| A-4.02.05P | check pitch and elevation of piping installation | pitch and elevation of piping installation is checked according to NFPA standards and site-specific requirements |
| A-4.02.06P | ensure that piping, components and devices are protected | piping, components and devices are protected against environmental conditions (interior and exterior) |
| A-4.02.07P | verify that ***foreign material*** is removed | ***pipe preparation*** is done to ensure that ***foreign*** ***material*** has been removed |
| A-4.02.08P | ensure pipe, systems and components are labelled | pipe, systems and components are labelled according to site specifications |
| A-4.02.09P | ensure that testing blanks and testing caps are removed and documentation has been completed | testing blanks and testing caps are removed to allow for system operation and documentation has been completed |
| A-4.02.10P | verify operation of ***control valves*** | full range of operation of ***control valves*** is verified |
| A-4.02.11P | verify fire protection system ***components*** | ***components*** are verified to confirm their performance meets design criteria |
| A-4.02.12P | verify that escutcheons and guards are in place | escutcheons and guards are in place and sprinkler protectors are removed |
| A-4.02.13P | verify operation of ***detection devices*** | operation of ***detection devices*** is verified according to AHJ-prescribed standards |
| A-4.02.14P | verify positioning of ***protection devices*** | positioning of ***protection devices*** is verified to ensure proper coverage is achieved |
| A-4.02.15P | verify operation of ***signal initiating devices*** | operation of ***signal initiating devices*** meets accepted parameters |
| A-4.02.16P | ensure that ***documentation*** is completed | ***documentation*** is completed and submitted according to project specifications, AHJ, NFPA, FM and CAN/ULC standards |

RANGE OF VARIABLES

***foreign material*** includes: cut-out discs, oil and welding slag

***pipe preparation*** includes: flushing, swabbing

***control valves*** include: post indicator valves (PIVs), butterfly valves, outside stem & yoke (OS&Y) valves

***components*** include: alarm valves, dry valves, deluge valves, check valves, accelerators

***detection devices*** include: heat-actuated devices (HADs), air sampling devices, linear heat detectors

***protection devices*** include: sprinklers, nozzles, emitters

***signal-initiating devices*** include: flow, pressure, tamper switches

***documentation*** includes: commissioning reports, as-built drawings

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-4.02.01L | demonstrate knowledge of the procedures to commission fire protection systems | define terminology associated with commissioning of fire protection systems |
|  |  | identify safety hazards and describe safe work practices pertaining to the commissioning of fire protection systems |
|  |  | interpret codes, standards and regulations pertaining to the commissioning of fire protection systems |
|  |  | interpret information pertaining to the commissioning of fire protection systems found on drawings and specifications |
|  |  | identify ***tests and checks*** to be performed on fire protection systems |
|  |  | describe the procedures used to commission fire protection systems |

RANGE OF VARIABLES

***tests and checks*** include: hydrostatic, pneumatic, seal of penetrations, placement of hangers, brackets, supports and restraints, grade and elevation, flushing and swabbing, labelling, blank testing gaskets, escutcheons

TASK A-5 Uses communication and mentoring techniques

TASK DESCRIPTOR

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

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| A-5.01 | Uses communication techniques |

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| **Essential Skills** | Oral Communication, Working with Others, Continuous Learning |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-5.01.01P | demonstrate two-way communication practices individually or in a group | instructions and messages are understood by both parties involved in communication |
| A-5.01.02P | listen using ***active listening*** practices | steps of ***active listening*** are used |
| A-5.01.03P | receive and respond to feedback on work | response to feedback indicates understanding and corrective measures are taken |
| A-5.01.04P | explain and provide feedback | explanation and feedback is provided and task is carried out as directed |
| A-5.01.05P | use questioning to improve communication | questions enhance understanding, on‑the‑job training and goal setting |
| A-5.01.06P | participate in safety and information meetings | meetings are attended and information is understood and applied |
| A-5.01.07P | communicate with ***non-tradespeople*** | technical information is relayed and understanding is confirmed |
| A-5.01.08P | communicate with other ***tradespeople*** | technical information is relayed and understanding is confirmed |

RANGE OF VARIABLES

***active listening*** includes: hearing, interpreting, reflecting, responding, paraphrasing

***non-tradespeople*** include: consultants, engineers, owners, end-users

***tradespeople*** include: crane operators, carpenters, plumbers, electricians, sheet metal workers, welders, steamfitter/pipefitters, refrigeration and air conditioning mechanics

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-5.01.01L | demonstrate knowledge of trade terminology | define terminology used in the trade |
| A-5.01.02L | demonstrate knowledge of effective communication practices | describe the importance of using effective verbal and non-verbal communication with ***people in the workplace*** |
|  |  | identify ***sources of information*** to effectively communicate |
|  |  | identify communication and ***learning styles*** |
|  |  | describe effective listening and speaking skills |
|  |  | identify ***personal responsibilities and attitudes*** that contribute to on-the-job success |
|  |  | identify the value of diversity in the workplace |
|  |  | identify communication that constitutes ***harassment*** and ***discrimination*** |

RANGE OF VARIABLES

***people in the workplace*** include: other tradespeople, colleagues, apprentices, supervisors, clients, AHJ, manufacturers

***sources of information*** include: regulations, codes, standards, OH&S requirements, AHJ requirements, prints, drawings, specifications, company and client documentation

***learning styles*** include: seeing it, hearing it, trying it

***personal responsibilities and attitudes*** include: asking questions, working safely, accepting constructive feedback, time management and punctuality, respect for authority, good stewardship of materials, tools and property, efficient work practices

***harassment*** includes: objectionable conduct, comment or display made either on a one-time or continuous basis that demeans, belittles, or causes personal humiliation or embarrassment to the recipient

***discrimination*** is prohibited based on race, national or ethnic origin, colour, religion, age, sex, sexual orientation, marital status, family status, disability or conviction for which a pardon has been granted

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| A-5.02 | Uses mentoring techniques |

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| **Essential Skills** | Oral Communication, Working with Others, Continuous Learning |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| A-5.02.01P | identify and communicate learning objective and point of lesson | apprentice or colleague can explain the objective and point of the lesson |
| A-5.02.02P | link lesson to other lessons and the job | lesson order and unplanned learning opportunities are defined |
| A-5.02.03P | demonstrate performance of a skill to an apprentice or colleague | ***steps required to demonstrate a skill*** are performed |
| A-5.02.04P | set up conditions required for an apprentice to practice a skill | ***practice conditions*** are set up so that the skill can be practiced safely by the apprentice |
| A-5.02.05P | assess apprentice or colleague’s ability to perform tasks with increasing independence | performance improves with practice to a point where skill can be done with little supervision |
| A-5.02.06P | give supportive and corrective feedback | apprentice adopts best practice after having been given supportive or corrective feedback |
| A-5.02.07P | support apprentices in pursuing technical training opportunities | technical training is completed within the timeframe prescribed by apprenticeship authority |
| A-5.02.08P | support equity group apprentices | workplace is harassment and discrimination-free |
| A-5.02.09P | implement probationary period to assess suitability to the trade | commitment is demonstrated and more suitable career options are provided if required |

RANGE OF VARIABLES

***steps required to demonstrate a skill*** include: understanding the who, what, where, when and why, explaining, showing, giving encouragement, following up to ensure skill is performed correctly

***practice conditions*** means: guided, limited independence, full independence

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| A-5.02.01L | demonstrate knowledge of strategies for learning skills in the workplace | describe the importance of individual experience |
|  |  | describe the shared responsibilities for workplace learning |
|  |  | determine one’s own learning preferences and explain how these relate to learning new skills |
|  |  | describe the importance of different types of skills in the workplace |
|  |  | describe the importance of ***essential skills*** in the workplace |
|  |  | identify different ways of learning |
|  |  | identify different ***learning needs*** and strategies to meet ***learning needs*** |
|  |  | identify ***strategies to assist in learning a skill*** |
| A-5.02.02L | demonstrate knowledge of strategies for teachingworkplace skills | identify different roles played by a workplace mentor |
|  |  | describe the ***steps*** involved in ***teaching skills*** |
|  |  | explain the importance of identifying the point of a lesson |
|  |  | identify how to choose a good time to present a lesson |
|  |  | explain the importance of linking the lessons |
|  |  | identify the components of the skill (the context) |
|  |  | describe considerations in setting up opportunities for skill practice |
|  |  | explain the importance of providing feedback |
|  |  | identify techniques for giving effective feedback |
|  |  | describe a skills assessment |
|  |  | identify methods of assessing progress |
|  |  | explain how to adjust a lesson in different situations |

RANGE OF VARIABLES

***essential skills*** are: reading, document use, writing, oral communication, numeracy, thinking, working with others, digital technology, continuous learning

***learning needs*** include: learning disabilities, learning preferences, language proficiency

***strategies to assist in learning a skill*** include: understanding the basic principles of instruction, developing coaching skills, being patient, providing feedback

***steps for teaching skills*** include: identifying the point of the lesson, linking the lesson, demonstrating the skill, providing practice, giving feedback, and assessing skills and progress

MAJOR WORK ACTIVITY B

Installs water supply

TASK B-6 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.

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| B-6.01 | Supervises trenching and backfilling (NOT COMMON CORE) |

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| **Essential Skills** | Working with Others, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-6.01.01P | lay out location for trench | location for trench is laid out to ensure accessibility for machinery, material and manpower |
| B-6.01.02P | verifylocation of underground/overhead ***utilities*** | location of underground/overhead ***utilities*** is verified to prevent injury and disruption of service |
| B-6.01.03P | coordinate tie-ins with AHJ | tie-ins are coordinated with AHJ to avoid or minimize disruptions to water supply |
| B-6.01.04P | inspect trench | trench is inspected for adequate size and depth according to OH&S and AHJ |
| B-6.01.05P | coordinate laydowns | laydowns for debris, backfill and installation material and tools are coordinated according to scope of work |
| B-6.01.06P | select backfill material | backfill material is selected according to piping requirements and local requirements |
| B-6.01.07P | ensure safe access to trench | safe access to trench is ensured for the installation of underground materials |
| B-6.01.08P | verify backfill compaction | backfill compaction is verified according to site requirements and specifications |

RANGE OF VARIABLES

***utilities*** include: gas, power, sewage, telephone

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-6.01.01L | demonstrate knowledge of safety procedures and requirements for trenching and backfilling in accordance with codes and regulations | identify codes and standards and AHJ requirements related to trenching and backfilling |
|  |  | identify tools and equipment and PPE related to trenching and backfilling |
|  |  | identify OH&S requirements related to trenching and backfilling |
|  |  | describe site conditions that affect trenching and backfilling |
|  |  | describe shoring requirements and piping requirements |
|  |  | identify types of access equipment related to trenching and backfilling |
| B-6.01.02L | demonstrate knowledge of communication practices for trenching and backfilling | describe audible/visual procedures for communicating during trenching and backfilling |

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| B-6.02 | Installs underground piping and components (NOT COMMON CORE) |

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| **Essential Skills** | Document Use, Numeracy, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-6.02.01P | identify type and class of piping material and fittings | type and class of piping material and fittings are identified according to AHJ, drawings, specifications and NFPA standards |
| B-6.02.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| B-6.02.03P | assemble pipe and fittings | pipe and fittings are assembled using ***joining methods*** according to specifications and NFPA standards |
| B-6.02.04P | 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, codes and standards |
| B-6.02.05P | apply ***protective material*** | ***protective material*** is applied below and above the pipe to prevent damage from ***foreign objects*** |
| B-6.02.06P | attach ***components*** | ***components*** are attached to piping to allow control and isolation of fire water system |
| B-6.02.07P | connect piping to water source | piping is connected to water source with ***devices*** to ensure adequate water supply to fire protection system |
| B-6.02.08P | lay tracer wire and identification ribbon | tracer wire and identification ribbon are laid with pipe according to jurisdictional requirements to allow for future location and identification of pipe |
| B-6.02.09P | ensure cathodic/corrosion protection | cathodic/corrosion protection meets manufacturers' specifications and AHJ |
| B-6.02.10P | allow for clearances and tolerances | clearances and tolerances between piping and ***surrounding environment*** are allowed for to prevent damage caused by excessive stress loads |
| B-6.02.11P | seal pipe penetrations | pipe penetrations through ***structures*** are sealed to maintain impermeability of structure using various ***materials*** |
| B-6.02.12P | terminate and cap pipe | pipe is terminated and capped in selected location inside building, ensuring its accessibility |
| B-6.02.13P | install testing connection to water termination point and fire hydrants | testing connection is installed to water termination point to allow for flushing, testing and chlorination according to AHJ, standards and codes |
| B-6.02.14P | test underground piping and components | underground piping and components are hydrostatically tested according to NFPA standards |

RANGE OF VARIABLES

***tools and equipment*** include: cut-off saws, portable grinders, torque wrenches, pry bars

***joining methods*** include: bell and spigot, flange with gasket, mechanical

***anchoring systems*** include: thrust blocks, rodding, anchors, clamps

***protective material*** includes: sand, screened gravel, landscaping fabric

***foreign objects*** include: rocks, roots, debris

***components*** include: gate valves, PIVs, fire hydrants

***devices*** include: tapping valves, underground tees

***surrounding environment*** includes: under railroad tracks, through concrete structures

***structures*** include: walls, foundations, floors

***materials*** include: cement, caulking, flexible mastic

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-6.02.01L | demonstrate knowledge of clearances and tolerances | identify where clearances and tolerances should be taken into consideration |
| B-6.02.02L | demonstrate knowledge of water source connections | identify ***types of water sources*** and their connection requirements |
|  |  | identify location of water source connection |
| B-6.02.03L | demonstrate knowledge of underground piping and their components’ installation procedures | define terminology associated with underground piping and components |
|  |  | identify worksite ***hazards*** and describe safe work practices pertaining to underground piping and components |
|  |  | interpret codes, standards and regulations pertaining to underground piping and their components |
|  |  | identify ***tools and equipment*** relating to underground piping and component installation |
|  |  | describe ***procedures used to install underground water mains*** |

RANGE OF VARIABLES

***types of water sources*** include: municipal water supply, raw water sources, tanks, cisterns

***hazards*** include: personal safety, safety of infrastructure, environmental requirements

***tools and equipment*** include: cut-off saws, portable grinders, torque wrenches, pry bars

***procedures used to install underground water mains*** include: joining, controlling thrust, trenching and shoring, bedding and backfilling, leakage testing, chlorination/disinfection, flushing, completing documentation

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| B-6.03 | Flushes underground system |

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| **Essential Skills** | Thinking, Document Use, Oral Communication |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-6.03.01P | select and install flanges, fittings and valves | flanges, fittings and valves are selected and installed on the underground connection inside the building to allow for required flow |
| B-6.03.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| B-6.03.03P | ensure underground control valve is open | underground control valve is open at water source to pressurize system |
| B-6.03.04P | connect hoses to flushing connections | hoses are connected to flushing connections at determined points and water is directed to safe location |
| B-6.03.05P | discharge water flow | water flow is discharged from flushing connections allowing predetermined flow requirements |
| B-6.03.06P | complete documentation | documentation is completed according to NFPA standards and AHJ |

RANGE OF VARIABLES

***tools and equipment*** include: pitot tube, fire hoses, fire hydrant wrenches, diffusers, burlap sack and tie wires

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-6.03.01L | demonstrate knowledge of flushing requirements of underground systems | identify codes and standards related to flushing of underground systems |
|  |  | identify required flow rates for flushing of underground systems |
|  |  | identify ***tools and equipment*** relating to flushing of underground systems and describe their applications and procedures for use |
| B-6.03.02L | demonstrate knowledge of safe work procedures for flushing of underground systems | identify worksite ***hazards*** and describe safe work practices pertaining to flushing of underground systems |
|  |  | describe the procedures used to flush underground systems |

RANGE OF VARIABLES

***tools and equipment*** include: pitot tube, fire hoses, fire hydrant wrenches, diffusers, burlap sack and tie wires

***hazards*** include: personal safety, safety of infrastructure, environmental requirements

TASK B-7 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.

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| B-7.01 | Determines location of pumps, drivers, controllers and components |

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| **Essential Skills** | Document Use, Numeracy, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-7.01.01P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| B-7.01.02P | inspect room layout | room layout is inspected prior to installation to confirm adequate space and prevent interference of pumps and components with other building services |
| B-7.01.03P | verify layout with drawings | layout is verified with drawings to ensure compliance with specifications |
| B-7.01.04P | lay out pumps and components | pumps and components are laid out in pump room to ensure accessibility for service |
| B-7.01.05P | determine if pump bypass is required | pump bypass is required when material value is provided by the water supply if the pump is not in operation according to NFPA standards and AHJ |

RANGE OF VARIABLES

***tools and equipment*** include: measuring devices, chalk lines, laser levels, straight edges, hoisting equipment

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-7.01.01L | demonstrate knowledge of pumps, drivers, controllers and components | define terminology associated with pumps, drivers, controllers and components |
|  |  | identify ***hazards*** and describe safe work practices pertaining to pumps, drivers, controllers and components |
|  |  | interpret codes, standards and regulations pertaining to the installation of pumps, drivers, controllers and components |
|  |  | interpret information pertaining to pumps, drivers, controllers and components, found on drawings and specifications |
|  |  | identify ***tools and equipment*** relating to determining location of pumps, drivers, controllers and components, and describe their applications and procedures for use |

RANGE OF VARIABLES

***hazards*** include: personal safety, safety of infrastructure, environmental requirements

***tools and equipment*** include: measuring devices, chalk lines, laser levels, straight edges, hoisting equipment

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| B-7.02 | Installs pumps, drivers, controllers and components |

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| **Essential Skills** | Document Use, Numeracy, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-7.02.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| B-7.02.02P | place pumps | pumps are placed in predetermined locations on a base or pad according to NFPA standard and manufacturers’ specifications |
| B-7.02.03P | adjust pump elevation | pump elevation is adjusted to set and secure pump in place using ***materials*** |
| B-7.02.04P | mount controllers and power transfer switches | controllers and power transfer switches are mounted in desired location within the pump room and within sight of the pump according to codes and standards |
| B-7.02.05P | connect piping and ***fire pump*** ***components*** | piping and ***fire pump*** ***components*** are connected to fire pump, jockey pump and controllers |
| B-7.02.06P | connect and align driver | driver is connected to and aligned with the pump using ***drive*** ***components*** to provide power to pump |
| B-7.02.07P | set fuel tanks and piping | fuel tanks and piping are set to allow fuel supply to diesel driver according to AHJ, NFPA and manufacturers’ specifications |
| B-7.02.08P | install fuel lines | fuel lines between tank and engine are installed according to AHJ, NFPA standards and building codes |
| B-7.02.09P | install exhaust system | exhaust system is installed to evacuate exhaust from the pump room to exterior according to AHJ, NFPA standards, manufacturers’ specification and building codes |
| B-7.02.10P | install strainers | strainers are installed on raw water supplies to protect pump from debris |
| B-7.02.11P | install required fire pump components | required ***fire pump components*** are installed according to manufacturers' specifications, NFPA standards and AHJ |

RANGE OF VARIABLES

***materials*** include: shims, mounts, grout and cement

***fire pump components*** include: sensing lines, test headers, flowmeters, bypass connections, relief valves, controller cabinets, suction and discharge piping, anti-vortex plate

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-7.02.01L | demonstrate knowledge of water source connections | define terminology associated with water supply and system demand |
|  |  | identify ***types of water supplies*** used for fire pump installations and system demand requirements |
|  |  | identify the requirements of cross-connection control as they relate to fire pump demand |
| B-7.02.02L | demonstrate knowledge of ***fire pump components*** and their installation | identify ***fire pumps components*** |
|  |  | identify ***types of fire pumps*** |
|  |  | interpret information pertaining to fire pumps found on drawings and specifications |
|  |  | identify tools and equipment relating to fire pump installation and describe their applications and procedures for use |
|  |  | describe the procedures used to install fire pumps |

RANGE OF VARIABLES

***types of water supplies*** include: municipal, limited (tanks, reservoirs), raw water

***fire pump components*** include: sensing lines, test headers, flowmeters, bypass connections, relief valves, controller cabinets, suction and discharge piping, anti-vortex plate

***types of fire pumps*** include: diesel, electric, steam

TASK B-8 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 connects hose lines from a pumper truck to the fire department connection. This connection allows the fire department to supplement the fire protection system in the event of a fire.

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| B-8.01 | Determines location, size and type of fire department connections |

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| **Essential Skills** | Document Use, Numeracy, Oral Communication |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-8.01.01P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| B-8.01.02P | confirm system layout | system layout is confirmed prior to installation to verify adequate space, heating, code requirements, accessibility for fire department and AHJ requirements |
| B-8.01.03P | verify layout with drawings | layout is verified with drawings to ensure compliance with AHJ and NFPA standards |
| B-8.01.04P | determine size and type of ***hose connection***, check valves and additional components | size and type of ***hose connection***, check valves and additional components are determined according to AHJ and NFPA standards |

RANGE OF VARIABLES

***tools and equipment*** include: measuring devices, levels, straight edges

***hose connections*** include: National Hose Standard (NHS), CSA, Storz

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-8.01.01L | demonstrate knowledge of fire department equipment and their installation procedures | identify required proximity of fire department connections in relation to hydrants |
|  |  | identify hazards and describe safe work practices pertaining to fire department connections |
|  |  | interpret codes, standards and regulations pertaining to fire department connections |
|  |  | interpret information pertaining to fire department connections, found on drawings and specifications |
|  |  | identify tools and equipment relating to fire department connections, and describe their applications and procedures for use |
|  |  | identify types of fire department connections, and describe their purpose and their ***installation requirements*** |

RANGE OF VARIABLES

***installation requirements*** include: requirements for check valves, placement of fire department connections, requirements for drainage of fire department connections, requirements for hose thread connections (AHJ)

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| B-8.02 | Installs fire department connection piping and components |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-8.02.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| B-8.02.02P | install pipe and devices for fire department connections | pipe and devices for fire department connections are installed according to NFPA standards and AHJ |
| B-8.02.03P | orient and confirm thread compatibility of the 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 |

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-8.02.01L | demonstrate knowledge of fire department equipment and their installation procedures | identify required proximity of fire department connections in relation to hydrants |
|  |  | identify hazards and describe safe work practices pertaining to fire department connections |
|  |  | interpret codes, standards and regulations pertaining to fire department connections |
|  |  | interpret information pertaining to fire department connections, found on drawings and specifications |
|  |  | identify tools and equipment relating to fire department connections, and describe their applications and procedures for use |
|  |  | identify types of fire department connections, and describe their purpose and their ***installation requirements*** |

RANGE OF VARIABLES

***installation requirements*** include: requirements for check valves, placement of fire department connections, requirements for drainage of fire department connections, requirements for hose thread connections (AHJ)

TASK B-9 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 can also be used as a secondary supply in areas where municipal supply is insufficient.

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| B-9.01 | Installs water tanks |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-9.01.01P | 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-9.01.02P | arrange for installation of base, mounts and anchors | base, mounts and anchors are installed to level, stabilize and support tank |
| B-9.01.03P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| B-9.01.04P | fill tank with water | tank is filled with water to verify its integrity according to specifications and AHJ |
| B-9.01.05P | 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 |

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-9.01.01L | demonstrate knowledge of water tanks | define terminology associated with water tanks |
|  |  | identify ***types of water tanks*** and describe their characteristics, principles of operation and applications |
|  |  | identify hazards and describe safe work practices pertaining to water tanks |
|  |  | interpret codes, standards and regulations pertaining to water tanks |
|  |  | identify tools and equipment relating to water tank installation and their applications and procedures for use |
|  |  | identify ***types of water connections*** and their associated components |
|  |  | identify the methods used for protection of tanks |

RANGE OF VARIABLES

***types of water tanks*** include: gravity, pressure, below grade, residential water supply

***types of water connections*** include: sprinkler valves, auto-fill valves

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| B-9.02 | Installs related equipment |

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| **Essential Skills** | Document Use, Numeracy, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| B-9.02.01P | install ***controlling*** ***devices*** | ***controlling devices*** are installed on tank and in reservoirs according to NFPA standards and AHJ |
| B-9.02.02P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| B-9.02.03P | install ***hydrants*** | ***hydrants*** are installed according to NFPA standards and AHJ |
| B-9.02.04P | install fill line | fill line is installed to tank to allow for periodic filling of water supply tank |
| B-9.02.05P | connect test connection | test connection from fire pump is connected to tank to conserve water during testing procedures according to site conditions and AHJ |
| B-9.02.06P | verify installation of anti-vortex plate | installation of anti-vortex plate is verified to be done when required by site conditions and AHJ |

RANGE OF VARIABLES

***controlling*** ***devices*** include: pressure switches, agitators, control valves, thermostats, check valves

***hydrants*** include: wall, roof, dry barrel, wet barrel

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| B-9.02.01L | demonstrate knowledge of installation of water tanks and ***related equipment*** | identify procedures used in the installation of water tanks and ***related equipment*** |
|  |  | interpret codes, standards and regulations pertaining to water tank installation and ***related equipment*** |
|  |  | interpret information pertaining to water tank and ***related equipment*** found on drawings and specifications |
|  |  | identify tools and equipment relating to water tank and ***related equipment*** installation and describe their applications and procedures for use |
|  |  | explain supply and discharge piping requirements |
|  |  | identify the arrangement of fire pump unit components |

RANGE OF VARIABLES

***related equipment*** includes: overflow, vent, water level, drain and heating system

MAJOR WORK ACTIVITY C

Installs piping

TASK C-10 Prepares pipe, tube and fittings for installation

TASK DESCRIPTOR

Sprinkler fitters prepare piping and fittings for the installation of the fire protection system. Preparation of piping can be done at a shop or on-site.

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| C-10.01 | Cuts pipe and tube |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.01.01P | select pipe | pipe is selected according to drawings and project specifications |
| C-10.01.02P | calculate, measure and mark pipe | pipe requirements are calculated, measured and marked according to drawings |
| C-10.01.03P | select and use ***tools and equipment*** | ***tools and equipment*** are selected according to ***pipe material*** and size, and used according to manufacturers' specifications and scope of work |
| C-10.01.04P | ream pipe | pipe is reamed according to industry practice to remove burrs to promote hydraulic efficiency |
| C-10.01.05P | verify cut | cut is verified square according to manufacturers' specifications |

RANGE OF VARIABLES

***tools and equipment*** include: pipe cutters, hacksaws, hydraulic cutters, chop saws

***pipe material*** includes: steel, copper, plastic, ductile iron

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.01.01L | demonstrate knowledge of pipe and tube cutting equipment and techniques | define terminology associated with cutting pipe and tube |
|  |  | identify hazards and describe safe work practices pertaining to cutting pipe and tube |
|  |  | interpret codes, standards and regulations pertaining to cutting pipe and tube |
|  |  | interpret information pertaining to cutting pipe and tube found on drawings and specifications |
|  |  | identify ***tools and equipment*** relating to pipe and tube cutting, and describe their applications and procedures for use |
|  |  | identify the ***factors to consider*** for selecting pipe and tube for cutting |
| C-10.01.02L | demonstrate knowledge of the procedures to cut pipe and tube | describe the procedures used to cut pipe and tube to required dimensions |

RANGE OF VARIABLES

***tools and equipment*** include: pipe cutters, hacksaws, hydraulic cutters, chop saws

***factors to consider*** for selecting pipe and tube for cutting include: grade, size, materials

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| C-10.02 | Bends pipe and tube |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.02.01P | select pipe schedule and material | pipe schedule and material is selected according to drawings |
| C-10.02.02P | select the application and location of bend | application and location for bend is selected according to NFPA standards |
| C-10.02.03P | determine the radius of the bend | radius of the bend is determined according to NFPA standards |
| C-10.02.04P | calculate bend angle | bend angle is calculated according to installation requirements and site conditions |
| C-10.02.05P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to manufacturers' specifications and scope of work |

RANGE OF VARIABLES

***tools and equipment*** include: chain vices, hydraulic benders, manual benders, torches

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.02.01L | demonstrate knowledge of the procedures used to bend pipe and tube | define terminology associated with bending pipe and tube |
|  |  | identify hazards and describe safe work practices pertaining to bending pipe and tube |
|  |  | identify the ***factors to consider*** for selecting pipe and tube for bending |
|  |  | describe the procedures used to bend pipe and tube to required dimensions |
|  |  | interpret codes, standards and regulations pertaining to bending pipe and tube |
|  |  | interpret information pertaining to bending pipe and tube found on drawings and specifications |
| C-10.02.02L | demonstrate knowledge of ***tools and equipment*** used for pipe and tube bending | identify ***tools and equipment*** relating to pipe and tube bending, and describe their applications and procedures for use |
| C-10.02.03L | demonstrate knowledge of procedures used to calculate degree of bend | describe basic trigonometry used to calculate angles |
|  |  | apply metric and imperial measurements |

RANGE OF VARIABLES

***factors to consider*** for bending pipe include: grade, size, material, schedule

***tools*** ***and equipment*** include: chain vices, hydraulic benders, manual benders, torches

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| C-10.03 | Threads pipe |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.03.01P | adjust die head | die head is adjusted to achieve ***thread specifications*** to allow installation of fittings |
| C-10.03.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to size and type of material |
| C-10.03.03P | support pipe | pipe is supported using pipe stands while threading to prevent damage to thread and equipment |
| C-10.03.04P | select and apply cutting oil | cutting oil is selected and applied according to piping material to prevent damage to dies and threads |
| C-10.03.05P | clean inside and outside of pipe | inside and outside of pipe is cleaned to remove excess cutting oil and shavings |

RANGE OF VARIABLES

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

***tools and equipment*** include: ratchet dies, oilers, universal dies, thread gauges

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.03.01L | demonstrate knowledge of the procedures used to thread pipe | define terminology associated with threading pipe |
|  |  | identify hazards and describe safe work procedures pertaining to threading pipe |
|  |  | identify ***types of threads*** |
|  |  | interpret codes, standards and regulations pertaining to threading pipe |
|  |  | interpret information pertaining to threading pipe found on drawings and specifications |
| C-10.03.02L | demonstrate knowledge of ***tools and equipment*** used to thread pipe | identify ***tools and equipment*** relating to threading pipe, and describe their applications and procedures for use |

RANGE OF VARIABLES

***types of threads*** include: National Pipe Thread (NPT), National Standard Thread (NST)

***tools and equipment*** include: ratchet dies, oilers, universal dies, thread gauges

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| C-10.04 | Grooves pipe |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.04.01P | identify the pipe material | pipe material is identified according to drawings and project specifications |
| C-10.04.02P | select ***grooving method*** | ***grooving method*** is selected according to manufacturers' specifications, and pipe schedule, material and size |
| C-10.04.03P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-10.04.04P | set up equipment | equipment is set up to achieve groove depth according to manufacturers' specifications |
| C-10.04.05P | support pipe | pipe is supported using pipe stands to prevent damage to groove and equipment |
| C-10.04.06P | select and apply cutting oil | cutting oil is selected and applied according to piping material to prevent damage to dies and cut grooves |
| C-10.04.07P | measure groove depth | groove depth is measured to ensure it corresponds to manufacturers' specifications for the couplings |
| C-10.04.08P | check flare | flare is measured to ensure it corresponds to manufacturers’ specifications |

RANGE OF VARIABLES

***grooving methods*** include: roll grooving, cut grooving

***tools and equipment*** include: hydraulic groovers, cut groovers, portable or in‑air/in-place groovers, pipe diameter tape, oilers

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.04.01L | demonstrate knowledge of the procedures to groove pipe | define terminology associated with grooving pipe |
|  |  | identify hazards and describe safe work practices pertaining to grooving pipe |
|  |  | interpret codes, standards and regulations pertaining to grooving pipe |
|  |  | interpret information pertaining to grooving pipe found on drawings and specifications |
| C-10.04.02L | demonstrate knowledge of ***tools and equipment*** used to groove pipe | identify ***tools and equipment*** relating to grooving pipe, and describe their applications and procedures for use |

RANGE OF VARIABLES

***tools and equipment*** include: hydraulic groovers, cut groovers, portable or in‑air/in-place groovers, pipe diameter tape, oilers

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| C-10.05 | Drills pipe and tube |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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| **NL** | **NS** | **PE** | **NB** | **QC** | **ON** | **MB** | **SK** | **AB** | **BC** | **NT** | **YT** | **NU** |
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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.05.01P | measure and mark pipe and tube | pipe and tube is measured and marked according to drawings |
| C-10.05.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-10.05.03P | find centre of pipe and tube | centre of pipe and tube is found using a centering punch |
| C-10.05.04P | drill hole in pipe and tube | hole in pipe and tube is drilled according to fitting and device specifications |
| C-10.05.05P | file hole | hole is filed to remove burrs |
| C-10.05.06P | recover cut-out disc | cut-out disc is recovered to prevent obstruction to flow |

RANGE OF VARIABLES

***tools and equipment*** include: drills, hole saws, centering punch, files, levels

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.05.01L | demonstrate knowledge of the procedures to drill pipe and tube | define terminology associated with drilling pipe and tube |
|  |  | identify hazards and describe safe work practices pertaining to drilling pipe and tube |
|  |  | interpret codes, standards and regulations pertaining to drilling pipe and tube |
|  |  | interpret information pertaining to pipe and tube drilling found on drawings and manufacturers’ specifications |
| C-10.05.02L | demonstrate knowledge of ***tools and equipment*** used to drill pipe and tube | identify ***tools and equipment*** relating to drilling pipe and tube, and describe their applications and procedures for use |

RANGE OF VARIABLES

***tools and equipment*** include: drills, hole saws, centering punch, files, levels

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| C-10.06 | Grinds pipe |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.06.01P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-10.06.02P | secure pipe | pipe is secured while grinding to prevent damage to pipe and equipment |
| C-10.06.03P | grind pipe ends | pipe ends are ground to ensure they are square and true |
| C-10.06.04P | bevel pipe | pipe is bevelled at required angle to promote weld penetration according to industry standards |
| C-10.06.05P | chamfer pipe for fittings | pipe is chamfered at angle according to manufacturers' specifications |

RANGE OF VARIABLES

***tools and equipment*** include: power grinders, files, chamfering tools, chain vices, pipe stands, bench vices

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.06.01L | demonstrate knowledge of the procedures used to grind pipe | define terminology associated with grinding pipe |
|  |  | identify hazards and describe safe work practices pertaining to grinding pipe |
|  |  | interpret codes, standards and regulations pertaining to grinding pipe |
|  |  | interpret information pertaining to grinding pipe found on drawings and specifications |
|  |  | describe the procedures used to grind pipe |
| C-10.06.02L | demonstrate knowledge of the ***tools and equipment*** used to grind pipe | identify ***tools and equipment*** used for grinding pipe and describe their applications and procedures for use |

RANGE OF VARIABLES

***tools and equipment*** include: power grinders, files, chamfering tools, chain vices, pipe stands, bench vices

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| C-10.07 | Prepares fittings |

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| **Essential Skills** | Numeracy, Thinking, Document Use |

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| **NL** | **NS** | **PE** | **NB** | **QC** | **ON** | **MB** | **SK** | **AB** | **BC** | **NT** | **YT** | **NU** |
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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-10.07.01P | select and use ***tools and materials*** | ***tools and materials*** are selected and used according to scope of work |
| C-10.07.02P | select fittings | fittingsare selected according to ***connection type*** |
| C-10.07.03P | select fitting size | fitting size is selected for the application according to drawings |
| C-10.07.04P | inspect fitting | fitting is inspected for ***deficiencies*** |
| C-10.07.05P | grease, sand, grind, clean and flux fitting | fitting is greased, sanded, ground, cleaned and fluxed according to the ***type of fitting*** |

RANGE OF VARIABLES

***tools and materials*** include: wire brushes, sand cloth, files, pipe joint compound or tape, flux, gasket lube

***connection type*** includes:flanged, threaded, grooved, soldered, brazed, welded

***deficiencies*** include: cracks, holes, absence of threads

***type of fitting*** includes: copper, plastic, steel, cast iron

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-10.07.01L | demonstrate knowledge of the procedures used to prepare pipe fittings | define terminology associated with pipe fittings |
|  |  | identify hazards and describe safe work practices pertaining to pipe fittings |
|  |  | interpret codes, standards and regulations pertaining to pipe fittings |
|  |  | interpret information pertaining to pipe fittings found on drawings and specifications |
| C-10.07.02L | demonstrate knowledge of the ***tools and materials*** used to prepare pipe fittings | identify ***tools and materials*** relating to preparing pipe fittings, and describe their applications and procedures for use |

RANGE OF VARIABLES

***tools and materials*** include: wire brushes, sand cloth, files, pipe joint compound or tape, flux, gasket lube

TASK C-11 Installs pipe, tube and fittings

TASK DESCRIPTOR

Sprinkler fitters connect various types of pipes, tubes and fittings (steel, plastic 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.

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| C-11.01 | Installs steel pipe, tube and fittings |

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| **Essential Skills** | Document Use, Thinking, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-11.01.01P | verify location and spacing | location and spacing of the main and branch lines are verified according to drawings and NFPA standards |
| C-11.01.02P | modify pipe and tube layout | pipe and tube layout is modified according to site conditions and ***design considerations*** |
| C-11.01.03P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-11.01.04P | install ***fittings*** on pipe and tube | ***fittings*** are installed on pipe and tube according to drawings |
| C-11.01.05P | install pipe and tube in hangers | pipe and tube are installed in hangers according to NFPA standards |
| C-11.01.06P | connect pipes and tubes | pipes and tubes are connected using ***fittings*** according to drawings and manufacturers' specifications |
| C-11.01.07P | orient ***fittings*** | ***fittings*** are oriented according to application and site conditions |
| C-11.01.08P | level or pitch pipe and tube | pipe and tube is run level or pitched according to fire protection system requirements and NFPA standards |

RANGE OF VARIABLES

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

***tools and equipment*** include: pipe wrenches, levels, wrenches, sockets, chain vices

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-11.01.01L | demonstrate knowledge of steel pipe, tube and ***fittings*** | define terminology associated with steel pipe, tube and ***fittings*** |
|  |  | identify ***types of steel pipe and tube*** |
|  |  | interpret codes, standards and regulations pertaining to steel pipe, tube and ***fittings*** |
|  |  | interpret information pertaining to steel pipe and tube installation found on drawings and specifications |
| C-11.01.02L | demonstrate knowledge of the procedures used to install steel pipe, tube and ***fittings*** | identify hazards and describe safe work practices related to installing steel pipe, tube and ***fittings*** |
|  |  | identify ***tools and equipment*** for installing steel pipe, tube and ***fittings*** and describe their applications and procedures for use |
|  |  | describe the procedures used to install steel pipe, tube and ***fittings*** |
|  |  | describe ***connection types*** related to steel pipe and tube |
|  |  | explain friction loss as it applies to steel pipe schedules and hydraulically calculated systems |
|  |  | identify the ***design*** ***considerations*** for installing steel pipe, tube and ***fittings*** |

RANGE OF VARIABLES

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

***types of steel pipe*** include: stainless, galvanized, carbon

***types of steel tube*** include: stainless, mild

***tools and equipment*** include: pipe wrenches, levels, wrenches, sockets, chain vices

***connection types*** include: flanged, threaded, grooved couplings, welded

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

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| C-11.02 | Installs plastic pipe, tube and fittings |

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| **Essential Skills** | Document Use, Thinking, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-11.02.01P | verify location and spacing of the main and branch lines | location and spacing of the main and branch lines is verified according to drawings and NFPA standards |
| C-11.02.02P | modify pipe and tube layout | pipe and tube layout is modified according to site conditions and ***design considerations*** |
| C-11.02.03P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-11.02.04P | install fittings on pipe and tube | fittings are installed on pipe and tube according to drawings |
| C-11.02.05P | install pipe and tube in hangers | pipe and tube are installed in hangers according to NFPA standards |
| C-11.02.06P | connect pipes and tubes | pipes and tubes are connected using ***fittings*** according to drawings and manufacturers' specifications |
| C-11.02.07P | orient ***fittings*** | ***fittings*** are oriented according to application and site conditions |
| C-11.02.08P | level or grade pipe and tube | pipe and tube are run level or graded according to fire protection system requirements and NFPA standards |

RANGE OF VARIABLES

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

***tools and equipment*** include: levels, wrenches

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-11.02.01L | demonstrate knowledge of plastic pipe, tube and ***fittings*** | define terminology associated with plastic pipe, tube and ***fittings*** |
|  |  | identify ***types of plastic pipe*** |
|  |  | interpret codes, standards and regulations pertaining to plastic pipe, tube and ***fittings*** |
|  |  | interpret information pertaining to plastic pipe and tube installation found on drawings and specifications |
| C-11.02.02L | demonstrate knowledge of the procedures used to install plastic pipe, tube and ***fittings*** | identify hazards and describe safe work practices related to installing plastic pipe, tube and ***fittings*** |
|  |  | identify ***tools and equipment*** for installing plastic pipe and tube and, describe their applications and procedures for use |
|  |  | describe the procedures used to install plastic pipe, tube and ***fittings*** |
|  |  | describe ***connection types*** related to plastic pipe and tube |
|  |  | explain friction loss as it applies to plastic pipe and tube and hydraulically calculated systems |
|  |  | identify compatibility of plastic pipe and tube with site conditions and other materials |
|  |  | identify the ***design*** ***considerations*** for installing plastic pipe, tube and ***fittings*** |

RANGE OF VARIABLES

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

***types of plastic pipe*** include: CPVC, cross-linked polyethylene (PEX), polyvinyl chloride (PVC)

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

***tools and equipment*** include: levels, wrenches

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

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| C-11.03 | Installs copper pipe, tube and fittings |

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| **Essential Skills** | Document Use, Thinking, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-11.03.01P | verify location and spacing of the main and branch lines | location and spacing of the main and branch lines is verified according to drawings and NFPA standards |
| C-11.03.02P | modify pipe and tube layout | pipe and tube layout is modified according to site conditions and ***design considerations*** |
| C-11.03.03P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-11.03.04P | select ***materials*** | ***materials*** are selectedaccordingto scope of work and job specifications |
| C-11.03.05P | install ***fittings*** on pipe and tube | ***fittings*** are installed on pipe and tube according to drawings |
| C-11.03.06P | install dielectric fittings | dielectric fittings are installed to prevent electrolysis caused by the joining of dissimilar metals |
| C-11.03.07P | install pipe and tube in hangers | pipe and tube are installed in hangers according to NFPA standards |
| C-11.03.08P | connect pipes and tubes | pipes and tubes are connected using ***fittings*** according to drawings and manufacturers' specifications |
| C-11.03.09P | orient ***fittings*** | ***fittings*** are oriented according to application and site conditions |
| C-11.03.10P | level or grade pipe and tube | pipe and tube are run level or graded according to fire protection system requirements and NFPA standards |

RANGE OF VARIABLES

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

***tools and equipment*** include: torches, levels, wrenches, sockets

***materials*** include: solder, brazing rods, flux, sand cloth

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-11.03.01L | demonstrate knowledge of copper pipe, tube and ***fittings*** | define terminology associated with copper pipes, tube and ***fittings*** |
|  |  | identify ***types of copper pipe and tube*** and their applications |
|  |  | interpret codes, standards and regulations pertaining to copper pipe, tube and ***fittings*** |
|  |  | interpret information pertaining to copper pipe and tube installation found on drawings and specifications |
| C-11.03.02L | demonstrate knowledge of the procedures used to install copper pipe, tube and ***fittings*** | identify ***hazards*** and describe safe work practices related to installing copper pipe, tube and ***fittings*** |
|  |  | identify ***tools and equipment*** for installing copper pipe, tube and ***fittings*** and describe their applications and procedures for use |
|  |  | describe the procedures used to install copper pipe, tube and ***fittings*** |
|  |  | describe ***connection types*** related to copper pipe |
|  |  | explain the effect of electrolysis on piping and tubing materials |  | explain the effect of electrolysis on piping materials |
|  |  | explain friction loss as it applies to copper pipe and tube, and hydraulically calculated systems |
|  |  | identify the ***design*** ***considerations*** for installing copper pipe, tube and ***fittings*** |
|  |  | describe the procedures used to prepare and assemble flare and compression joints using hand tools |
| C-11.03.03L | demonstrate knowledge of the procedures used to braze and solder joints | identify ***hazards*** and describe safe work practices pertaining to brazing and soldering joints |
|  |  | interpret codes, standards and regulations pertaining to brazing and soldering joints |
|  |  | interpret information, pertaining to brazing and soldering joints found on drawings and specifications |
|  |  | identify ***materials*** and equipment used for brazing and soldering joints, and describe their applications |
|  |  | describe the procedures used to solder and braze joints |
|  |  | identify ***types of*** ***solders and brazing alloys***, and describe their characteristics and applications |
|  |  | identify types of flux used in soldering or brazing and describe their purpose, applications and effects |

RANGE OF VARIABLES

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

***types of copper pipe and tube*** include: K, L, M

***hazards*** include: fire prevention, hot work procedures

***tools and equipment*** include: torches, levels, wrenches, sockets

***connection types*** include: soldering, brazing, using grooved couplings, compression type fittings

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

***materials*** include: solder, brazing rods, flux, sand cloth

***types of*** ***solders and brazing alloys*** include: 95/5, lead-free, BCuP

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| C-11.04 | Paints and labels pipe and tube |

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| **Essential Skills** | Document Use, Thinking, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-11.04.01P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-11.04.02P | select paint | paint used for identification and corrosion protection is selected according to project specifications |
| C-11.04.03P | mix paint and epoxy | paint and epoxy are mixed according to manufacturers’ specifications |
| C-11.04.04P | paint over wrench marks and bare threads | wrench marks and bare threads are painted over according to project specifications |
| C-11.04.05P | select type, size and spacing of labels | type, size and spacing of labelling is selected for pipe identification according to project specifications |

RANGE OF VARIABLES

***tools and equipment*** include: paint brushes, paint guns, stencils, wire brushes

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-11.04.01L | demonstrate knowledge of the procedures used to paint and label pipe and tube | identify symbols pertaining to labelling pipe and tube |
|  |  | identify hazards and describe safe work procedures pertaining to painting pipe and tube |
|  |  | interpret specifications pertaining to labeling pipe and tube |
|  |  | describe the procedures and materials used to paint and label pipe and tube |

TASK C-12 Installs piping components

TASK DESCRIPTOR

Sprinkler fitters connect various types of components such as accelerators, air compressors, sprinklers, nozzles and valves to the piping system to achieve a complete and efficient fire protection system according to drawings, AHJ and NFPA standards.

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| C-12.01 | Selects sprinklers |

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| **Essential Skills** | Thinking, Document Use, Reading |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.01.01P | identify sprinklers’ temperature classification | sprinklers’ temperature classification is identified according to NFPA standards |
| C-12.01.02P | identify ***sprinklers*** | ***sprinklers*** are identified to provide coverage according to ***conditions,*** ***occupancy classifications*** and ***commodity classifications*** according to drawings and NFPA standards |
| C-12.01.03P | interpret information listing | information on sprinklers’ listing is interpreted according to manufacturers' specifications |

RANGE OF VARIABLES

***sprinklers*** include: automatic (solder, bulb, open), 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)

***conditions*** include: freezing, excessive heat, corrosive environment

***occupancy classifications*** include: light hazard, ordinary hazard, extra hazard

***commodity classifications*** include: high pile storage, in-rack, solid pile

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.01.01L | demonstrate knowledge of sprinklersand their selection | define terminology associated with sprinklers |
|  |  | identify hazards and describe safe work practices pertaining to sprinklers |
|  |  | interpret codes, standards and regulations pertaining to sprinklers |
|  |  | interpret ***information*** pertaining to sprinklersfound on drawings, specifications and listings |
|  |  | explain the operation of sprinklers |
|  |  | identify ***types of sprinklers***, and describe their characteristics and applications |
|  |  | identify ***conditions***, hazard classification and ***commodity classification*** for selecting sprinklers |
|  |  | identify ***temperature ratings*** and colour coding |
|  |  | identify ***performance characteristics*** that apply to sprinklers |
|  |  | identify ***location requirements*** |

RANGE OF VARIABLES

***types of sprinklers*** include: automatic (solder, bulb, open), 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*** includes: listings, K‑factor, temperature, date of manufacture, sprinkler identification number (SIN)

***conditions*** include: freezing, excessive heat, corrosive environment

***commodity classifications*** include: high pile storage, in-rack, solid pile

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

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

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

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| C-12.02 | Installs sprinklers and nozzles |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.02.01P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work and manufacturers' specifications |
| C-12.02.02P | inspect for ***deficiencies*** | sprinklers and nozzles are inspected for ***deficiencies*** |
| C-12.02.03P | apply thread lubricant | thread lubricant is applied to prevent leakage and ensure fit according to industry practice |
| C-12.02.04P | position sprinklers and nozzles | sprinklers and nozzles are positioned according to manufacturers' specifications and NFPA standards |
| C-12.02.05P | select and install ***temporary protection*** | ***temporary*** ***protection*** is selected and installed to protect the sprinklers and nozzles from potential damage until job is completed |
| C-12.02.06P | select and install ***finishing*** ***plates*** | ***finishing*** ***plates*** are selected and installed according to manufacturers' specifications |
| C-12.02.07P | select and install permanent ***sprinkler protectors*** | permanent ***sprinkler protectors*** are selected and installed according to manufacturers' specifications and site conditions |

RANGE OF VARIABLES

***tools and equipment*** include: sprinkler wrench, sprinkler socket

***deficiencies*** include: broken bulbs, bent deflectors, bad threads, corrosion, lack of air bubble, no fluid

***temporary protection*** includes: manufacturers' supplied protective caps, aluminium foil, plastic bags

***finishing plates*** include: concealed, recess, deep cup escutcheons

***sprinkler protectors*** include: sprinkler guards, wax coated, paper bags

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.02.01L | demonstrate knowledge of ***sprinklers*** and ***nozzles*** | define terminology associated with ***sprinklers*** and ***nozzles*** |
|  |  | identify hazards and describe safe work practices pertaining to ***sprinklers*** and ***nozzles*** |
|  |  | interpret codes, standards and regulations pertaining to ***sprinklers*** and ***nozzles*** |
|  |  | interpret information pertaining to ***sprinklers*** and ***nozzles*** found on drawings, specifications and listings |
|  |  | identify tools and equipment relating to ***sprinklers*** and ***nozzles***, and describe their applications and procedures for use |
|  |  | explain the operation of ***sprinklers*** and ***nozzles*** and systems |
|  |  | identify types of ***sprinklers*** and ***nozzles***, and describe their characteristics and applications |
| C-12.02.02L | demonstrate knowledge of ***sprinklers*** and ***nozzles*** installation | describe the procedures used to install ***sprinklers*** and ***nozzles*** |
|  |  | describe the procedures used and the factors to consider to protect, handle and care for ***sprinklers*** and ***nozzles*** prior to and during the installation process |
|  |  | explain the importance of correct positioning for ***sprinklers*** and ***nozzles*** |
|  |  | identify required distances between standard spray and extended coverage ***sprinklers*** based on ***occupancy classification,*** manufacturers’ specifications and NFPA standards |
|  |  | identify obstructions of ***sprinklers*** and ***nozzles*** |
|  |  | identify clearances required between piled storage materials and sprinkler deflectors |
|  |  | identify the factors that affect maximum ceiling temperature |
|  |  | identify ***temperature ratings*** and colour coding |
|  |  | identify ***performance characteristics*** that apply to automatic ***sprinklers*** |

RANGE OF VARIABLES

***sprinklers*** include: automatic (solder, bulb, open), standard spray (upright, pendant, 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)

***nozzles*** include: foam, CO2, clean agent

***occupancy classifications*** include: light hazard, ordinary hazard, extra hazard

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

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

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| C-12.03 | Installs sleeves |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.03.01P | select sleeve material, diameter and length | sleeve material, diameter and length is selected according to ***factors*** |
| C-12.03.02P | measure and determine sleeve location | sleeve location is measured and determined according to drawings prior to the concrete being poured |
| C-12.03.03P | attach sleeve to forms | sleeve is attached to forms using nails or screws when installed prior to concrete pour according to industry standards |
| C-12.03.04P | select ***tools and equipment*** | ***tools and equipment*** are selected according to scope of work |
| C-12.03.05P | cut holes for sleeves | holes are cut for sleeves through existing concrete according to scope of work |
| C-12.03.06P | select and apply fire stopping, caulking and sealant | fire stopping, caulking and sealant are selected and applied according to manufacturers' specifications |

RANGE OF VARIABLES

***factors*** for selecting include: pipe size, wall and floor thickness, NFPA standards

***tools and equipment*** include: hammer drills, coring drills, hammers, cold chisels

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.03.01L | demonstrate knowledge of pipe sleeves and their installation | identify terminology related to pipe sleeve installation |
|  |  | identify hazards and safe work practices related to pipe sleeve installation |
|  |  | interpret codes, standards and regulations pertaining to pipe sleeves |
|  |  | describe the procedures used to size and install pipe sleeves |
|  |  | identify ***tools and equipment*** relating to the installation of pipe sleeves, and describe their applications and procedures for use |

RANGE OF VARIABLES

***tools and equipment*** include: hammer drills, coring drills, hammers, cold chisels

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| C-12.04 | Installs supports and hangers |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.04.01P | select ***supports*** and ***hangers*** | ***supports*** and ***hangers*** are selected according to ***factors*** |
| C-12.04.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-12.04.03P | calculate size of trapeze hangers | size of trapeze hangers is calculated according to NFPA standards |
| C-12.04.04P | calculate rod size and length | rod size and length are calculated according to ***factors*** |
| C-12.04.05P | select attachment points for ***supports*** | attachment points for ***supports*** are selected according to NFPA standards |
| C-12.04.06P | fasten ***supports*** and ***hangers*** | ***supports*** and ***hangers*** are fastened to the attachment points on the ***structure material*** according to project and manufacturers' specifications, NFPA standards and AHJ |

RANGE OF VARIABLES

***supports*** include: ceiling flanges, side beam attachments, C-clamps

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

***factors*** for selecting include: pipe material, pipe size, spacing, application, NFPA standards

***tools and equipment*** include: hammer drills, adjustable wrenches, hacksaws, pliers

***factors*** for calculating size include: pipe material, spacing, application, NFPA standards

***structure material*** includes: wood, concrete, steel, lathe and plaster

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.04.01L | demonstrate knowledge of ***supports*** and ***hangers*** and their installation procedures | define terminology associated with ***supports*** and ***hangers*** |
|  |  | identify hazards and describe safe work practices pertaining to ***supports*** and ***hangers*** |
|  |  | interpret codes, standards and regulations pertaining to ***supports*** and ***hangers*** |
|  |  | interpret information pertaining to ***supports*** and ***hangers*** found on drawings and specifications |
|  |  | identify the ***factors to consider*** to perform grade and ***hanger*** location calculations |
|  |  | identify ***tools and equipment*** relating to ***supports*** and ***hangers*** and describe their applications and procedures for use |
|  |  | identify types of ***supports*** and ***hangers*** used in the installation of pipe, tube and tubing, and describe their characteristics and applications |
|  |  | identify ***supports*** and ***hanger*** requirements for various systems |
|  |  | identify types and sizes of hanger rods, and describe their characteristics and applications |
|  |  | identify types of protective materials applied to hangers and describe their purpose and applications |
|  |  | identify types of fasteners and inserts, and describe their characteristics and applications |
|  |  | describe the procedures used to install ***supports*** and ***hangers*** |
|  |  | describe the procedures used to install ***fasteners*** into ***structure material*** |

RANGE OF VARIABLES

***supports*** include: ceiling flanges, side beam attachments, C-clamps

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

***factors to consider*** for calculating grade include: grade on pipe, slope of ceiling, hanger spacing, distance from hanger to attachment points

***tools and equipment*** include: hammer drills, adjustable wrenches, hacksaws, pliers

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

***structure material*** includes: wood, concrete, steel, lathe and plaster

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| C-12.05 | Installs seismic protection |

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| **Essential Skills** | Document Use, Thinking, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.05.01P | select location, material, diameter and length of ***brace*** | location, material, diameter and length of ***brace*** is selected according to ***factors*** |
| C-12.05.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-12.05.03P | determine NFPA-prescribed angle | NFPA-prescribed angle of the brace or restraint is determined in relation to the pipe and the place of attachment, and site conditions |
| C-12.05.04P | attach brace attachment | brace attachment is attached to the building structure according to NFPA standards, manufacturers' specifications, AHJ and drawings |
| C-12.05.05P | determine the brace length | brace length between brace attachment and pipe attachment is determined according to NFPA standards, manufacturers' specifications and AHJ |
| C-12.05.06P | cut ***bracing materials*** | ***bracing materials*** are cut to length according to site conditions |
| C-12.05.07P | install ***bracing materials*** and attachment | ***bracing materials*** and attachment are connected to the brace attachment according to NFPA standards, manufacturers' specifications and AHJ |
| C-12.05.08P | install flexible joints | flexible joints are installed according to AHJ and NFPA standards |
| C-12.05.09P | install measures to prevent ***movement*** of pipe in hangers | pipe is protected from ***movement*** in hangers |

RANGE OF VARIABLES

***brace*** includes: longitudinal, lateral, restraint wire, restraint straps, 4-way

f***actors*** for selecting include: pipe size, location of structural members, drawings, NFPA standards

***tools and equipment*** include: hammer drills, wrenches, pipe cutters, hacksaws, screwdrivers, pipes, adjustable wrenches, wire cutters

***bracing materials*** include: pipe, angle iron, rod

***movement*** includes: seismic activity, vibration, pipe thrust, water hammer

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.05.01L | demonstrate knowledge of the procedures to select and locate sway/seismic bracing | define terminology associated with sway/seismic bracing |
|  |  | identify hazards and describe safe work practices pertaining to sway/seismic bracing |
|  |  | interpret codes, standards and regulations pertaining to sway/seismic bracing |
|  |  | interpret information pertaining to sway/seismic bracing found on drawings and specifications |
| C-12.05.02L | demonstrate knowledge of the procedures used to install sway/seismic bracing | identify ***tools and equipment*** relating to sway/seismic bracing, and describe the applications and procedures for use |
|  |  | identify types of sway/seismic bracing and describe their purpose and applications |
|  |  | describe the procedures used to install sway/seismic bracing assemblies |
|  |  | identify types of fasteners and inserts, and describe their characteristics and applications |
|  |  | describe the procedures used to install fasteners and inserts |
|  |  | describe the procedures used to install flexible joints |

RANGE OF VARIABLES

***tools and equipment*** include: hammer drills, wrenches, pipe cutters, hacksaws, screwdrivers, pipes, adjustable wrenches, wire cutters

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| C-12.06 | Installs cross-connection control assemblies |

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| **Essential Skills** | Document Use, Continuous Learning, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.06.01P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| C-12.06.02P | identify and install ***cross-connection control assembly*** | ***cross-connection control assemblies*** are identified and installed according to plans, specifications and municipal regulations using ***methods*** appropriate to the device |
| C-12.06.03P | test operation of ***cross-connection control assembly*** | operation of ***cross-connection control assemblies*** is tested and documented according to AHJ |

RANGE OF VARIABLES

***tools and equipment*** include: combination wrenches, pipe wrenches, measuring devices

***cross-connection control assemblies*** include: reduced pressure backflow (RP), double check valve assembly (DCVA)

***methods*** for installing include: grooving, flanging, threading

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.06.01L | demonstrate knowledge of cross-connection control assemblies, their characteristics, purpose, applications and operation | define terminology associated with cross-connection control assemblies |
|  |  | identify ***types of cross-connection control assemblies***, and describe their characteristics, purpose and operation |
|  |  | identify hazards and describe safe work practices pertaining to cross-connection control assemblies |
|  |  | interpret codes, standards and regulations pertaining to cross-connection control assemblies |
|  |  | identify training and certification requirements regarding testing of cross-connection control assemblies |
| C-12.06.02L | demonstrate knowledge of the procedures to install cross-connection control assemblies | interpret information pertaining to cross-connection control assemblies found on drawings and specifications |
|  |  | identify tools and equipment pertaining to cross-connection control assemblies, and describe their applications and procedures for use |
|  |  | identify the factors to consider for selecting and installing cross-connection control assemblies |
|  |  | describe the procedures used to install cross-connection control assemblies |

RANGE OF VARIABLES

***types of cross-connection control assemblies*** include: RP, DCVA

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| C-12.07 | Installs system drainage |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| C-12.07.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| C-12.07.02P | determine pipe size and measure locations of drain lines | pipe size and locations of drain lines are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| C-12.07.03P | measure and determine locations and requirements of ***components*** | locations and requirements of ***components*** are measured and determined according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| C-12.07.04P | measure and fabricate ***piping*** | ***piping*** is measured and fabricated on-site for installation according to drawings, AHJ, NFPA standards and site conditions |
| C-12.07.05P | install drain lines | drain lines are installed according to drawings, site conditions, AHJ and NFPA standards |

RANGE OF VARIABLES

***components*** include: drain valves, drain cups, air gaps

***piping*** includes: steel, copper, plastic

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| C-12.07.01L | demonstrate knowledge of system drainage, and their operation and characteristics | define terminology associated with system drainage |
|  |  | identify hazards and describe safe work practices pertaining to system drainage |
|  |  | interpret codes, standards and regulations pertaining to system drainage |
|  |  | interpret information pertaining to system drainage found on drawings and specifications |
|  |  | identify tools and equipment relating to system drainage, and describe their applications and procedures for use |
|  |  | identify ***types of*** ***system drainage*** and describe their operating principles and characteristics |
|  |  | identify system drainage ***components*** and describe their location, purpose and operation |
| C-12.07.02L | demonstrate knowledge of the procedures to install system drainageand ***components*** according to code requirements | describe the procedures used to lay out and install system drainage and ***components*** |

RANGE OF VARIABLES

***types of system drainage*** include: main, auxiliary, sectional

***components*** include: drain valves, drain cups, air gaps

MAJOR WORK ACTIVITY D

Installs and lays out fire protection systems and devices

TASK D-13 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 the fire to suppress or control the fire.

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| D-13.01 | Installs wet pipe systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.01.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.01.02P | 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 NFPA standards |
| D-13.01.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.01.04P | determine and measure locations of auxiliary drains and requirements for valves | locations of auxiliary drains and requirements for valves are determined and measured according to NFPA standards to ensure accessibility for servicing and testing |
| D-13.01.05P | measure and fabricate ***piping*** | ***piping*** is measured and fabricated for installation according to drawings, AHJ, NFPA standards and site conditions |
| D-13.01.06P | 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 NFPA standards |
| D-13.01.07P | connect piping to water supply | piping is connected to water supply using ***methods*** according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.01.08P | install ***auxiliary*** ***devices*** | ***auxiliary*** ***devices*** are installed according to NFPA standards to ensure accessibility for servicing and testing |
| D-13.01.09P | measure and install ***alarm valve trim*** | ***alarm valve trim*** is measured and installed according to manufacturers’ specifications and NFPA standards |
| D-13.01.10P | pressure test wet pipe system | wet pipe system is pressure tested according to NFPA standards and AHJ |
| D-13.01.11P | install ***signage and identification*** | ***signage and identification*** are installed according to NFPA standards and AHJ |

RANGE OF VARIABLES

***components*** include: fire department connection, 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*** includes: risers, starter pieces, drops, branch lines, feed mains, riser nipples, cross mains

***methods*** include: flanged, soldered, welded, grooved, threaded joints

***auxiliary*** ***devices*** include: water motor gongs, excess pressure pumps, signalling devices

***alarm valve trim*** includes: alarm test valves, main drains, pressure gauges

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.01.01L | demonstrate knowledge of wet pipe systems, and their operation and characteristics | define terminology associated with wet pipe systems |
|  |  | identify hazards and describe safe work practices pertaining to wet pipe systems |
|  |  | interpret codes, standards and regulations pertaining to wet pipe systems |
|  |  | interpret information pertaining to wet pipe systems found on drawings and specifications |
|  |  | identify tools and equipment relating to wet pipe systems, and describe their applications and procedures for use |
|  |  | identify ***types of*** ***wet pipe systems*** and describe their operating principles and characteristics |
|  |  | identify wet pipe system ***components*** and describe their location, purpose and operation |
|  |  | identify alarm valves to be trimmed and describe their ***components*** and relevant design characteristics |
|  |  | determine characteristics and application of sprinklers |
|  |  | *identify* ***design criteria*** for wet pipe systems |
|  |  | identify drainage requirements for each water-based system |
| D-13.01.02L | demonstrate knowledge of the procedures used to install wet pipe systems and ***components*** | describe the procedures used to lay out and install wet pipe systems and ***components*** |
|  |  | describe the procedures used to install alarm valve trim |
|  |  | identify the factors to consider and requirements for installing auxiliary drains on wet pipe systems |
|  |  | describe the preventative methods used to prevent false alarms |
|  |  | identify the requirements for pressure testing of wet pipe systems and describe the associated procedures |
|  |  | describe methods used to prevent freezing |

RANGE OF VARIABLES

***types of*** ***wet pipe systems*** are only tree, gridded, looped

***components*** include: fire department connection, 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*** includes: density, square footage, occupancy classifications

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| D-13.02 | Installs dry pipe systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.02.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.02.02P | determine and measure locations and grades for main and branch lines | locations and grades for main and branch lines are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.02.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.02.04P | determine and measure locations of auxiliary drains and requirements for valves | locations of auxiliary drains and requirements for valves are determined and measured according to NFPA standards to ensure accessibility for servicing, testing and winterizing |
| D-13.02.05P | identify ***devices*** | ***devices*** are identified according to NFPA standards in installation locations that are subject to freezing |
| D-13.02.06P | 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 NFPA standards |
| D-13.02.07P | connect piping to water supply | piping is connected to water supply using ***methods*** according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.02.08P | install auxiliary ***devices*** | auxiliary ***devices*** are installed according to NFPA standards to ensure accessibility for servicing, testing and winterizing |
| D-13.02.09P | measure and install dry pipe valves and associated ***trim*** | dry pipe valves and associated ***trim*** are measured and installed according to manufacturers’ specifications and NFPA standards |
| D-13.02.10P | determine system capacity | system capacity of dry pipe systems is determined according to NFPA standards |
| D-13.02.11P | perform calculations | calculations are performed according to NFPA standards on the required fill-time of compressed air or nitrogen |
| D-13.02.12P | perform pressure tests | pressure tests are performed according to NFPA standards and AHJ |

RANGE OF VARIABLES

***components*** include: 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

***devices*** include: dry pendant sprinklers, approved gaskets, air dryers

***methods*** include: flanged, brazed, welded, grooved, threaded joints

***trim*** includes: low air pressure switches, QODs, air maintenance devices

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.02.01L | demonstrate knowledge of dry pipe systems, their operation and characteristics | define terminology associated with dry pipe systems |
|  |  | identify hazards and describe safe work practices pertaining to dry pipe systems |
|  |  | interpret codes, standards and regulations pertaining to dry pipe systems |
|  |  | interpret information pertaining to dry pipe systems found on drawings and specifications |
|  |  | identify tools and equipment relating to dry pipe systems, and describe their applications and procedures for use |
|  |  | identify ***types of dry pipe systems***, and describe their operating principles and characteristics |
|  |  | identify dry pipe system ***components***, and describe their locations, purpose and operation |
| D-13.02.02L | demonstrate knowledge of the procedures used to install dry pipe systems and their ***components*** | identify dry pipe valves to be trimmed, and describe their ***components*** and design characteristics |
|  |  | identify the factors to consider and requirements for installing auxiliary drains on dry pipe systems |
|  |  | identify the requirements for pressure testing of dry pipe systems and describe the associated procedures |
|  |  | describe the procedures used to lay out and install dry pipe systems and ***components*** |
|  |  | describe the procedures used to install dry pipe valve trim |
|  |  | describe the ***preventative*** ***methods*** used to prevent false alarms |
|  |  | identify calculations pertaining to capacity of dry pipe systems and air or nitrogen supply |

RANGE OF VARIABLES

***types of dry pipe systems*** are tree and looped

***components*** include: 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

***preventative methods*** include: use of air and nitrogen supply, air dryer, air maintenance device

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| D-13.03 | Installs antifreeze systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.03.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.03.02P | 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 NFPA standards |
| D-13.03.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.03.04P | determine and measure locations of auxiliary drains and requirements for valves | locations of auxiliary drains and requirements for valves are determined and measured according to NFPA standards to ensure accessibility for servicing and testing |
| D-13.03.05P | measure and fabricate ***piping*** | ***piping*** is measured and fabricated for installation according to drawings, NFPA standards, AHJ and site conditions |
| D-13.03.06P | connect ***piping*** to water supply | ***piping*** is connected to water supply using ***methods*** according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.03.07P | determine antifreeze strength | antifreeze strength is determined according to NFPA guidelines and temperature of protected spaces and solution flammability restrictions by using refractometers |
| D-13.03.08P | install ***auxiliary*** ***devices*** | ***auxiliary*** ***devices*** are installed according to NFPA standards to ensure accessibility for servicing and testing |
| D-13.03.09P | vent air | air from system is vented at high point when filling system with antifreeze to prevent dilution of antifreeze by water |
| D-13.03.10P | determine system capacity | system capacity of antifreeze system is determined according to NFPA standards |
| D-13.03.11P | perform ***pressure tests*** | ***pressure tests*** are performed according to NFPA standards and AHJ |
| D-13.03.12P | install ***components*** | ***components*** are installed to protect systems’ integrity |

RANGE OF VARIABLES

***components*** include: expansion tanks, RP, check valves

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

***methods*** include: flanged, soldered, welded, grooved, threaded joints

***auxiliary devices*** include: flow switches, test points, fill cups

***pressure tests*** include: hydrostatic, pneumatic testing

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.03.01L | demonstrate knowledge of antifreeze systems, their operation and characteristics | define terminology associated with antifreeze systems |
|  |  | identify hazards and describe safe work practices pertaining to antifreeze systems |
|  |  | interpret codes, standards and regulations pertaining to antifreeze systems |
|  |  | interpret information pertaining to antifreeze systems found on drawings and specifications |
|  |  | identify tools and equipment relating to antifreeze systems, and describe their applications and procedures for use |
|  |  | identify the ***factors*** to consider for determining the need for freezing protection or antifreeze systems |
|  |  | identify ***types of*** ***antifreeze systems*** and their components, and describe their purpose and applications |
|  |  | identify ***types and mixtures of antifreeze solutions***, and describe their characteristics and applications |
|  |  | identify the requirements and describe the procedures used to handle, store and dispose of antifreeze |
|  |  | identify valves required for antifreeze systems |
| D-13.03.02L | demonstrate knowledge of the procedures to install and maintain antifreeze systems | identify ***installation requirements*** for antifreeze systems |
|  |  | describe the procedures used to lay out and install antifreeze systems |
|  |  | describe the procedures used to test and maintain antifreeze systems |
|  |  | identify the requirements for pressure testing of antifreeze systems, and describe the associated procedures |

RANGE OF VARIABLES

***factors*** include: location, accessibility, cost

***types of*** ***antifreeze systems*** include: configuration*,* types of solutions, temperature mixtures

***types and mixtures of antifreeze solutions*** include: used with potable water supply, used with non-potable water supply

***installation requirements*** include: antifreeze loop, cross-connection control

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| D-13.04 | Installs preaction/deluge systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.04.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.04.02P | 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 NFPA standards |
| D-13.04.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.04.04P | determine and measure locations of auxiliary drains and requirements for valves | locations of auxiliary drains and requirements for valves are determined and measured according to NFPA standards to ensure accessibility for servicing, testing and winterizing |
| D-13.04.05P | identify ***devices*** | ***devices*** are identified according to NFPA standards in installation locations that are subject to freezing |
| D-13.04.06P | install preaction and deluge valves and ***trim*** | preaction and deluge valves and ***trim*** are installed according to manufacturers’ specifications and NFPA standards |
| D-13.04.07P | install return bends and flexible drops on preaction and deluge systems | return bends and flexible drops are installed on preaction and deluge systems according to NFPA standards to prevent plugging of sprinklers |
| D-13.04.08P | perform functional tests and meet intended ***design criteria*** | functional tests are performed to verify operation of components and meet intended ***design criteria*** |
| D-13.04.09P | perform pressure tests | pressure tests are performed according to NFPA standards and AHJ |

RANGE OF VARIABLES

***components*** include: 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, high/low supervisory devices, pressure gauges

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

***trim*** includes: solenoid actuators, diaphragm actuators

***design criteria*** includes: interlock, double interlock, non-interlock, cross zoning

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.04.01L | demonstrate knowledge of preaction/deluge systems, their applications and operating principles | define terminology associated with preaction/deluge systems |
|  |  | identify hazards and describe safe work practices pertaining to preaction/deluge systems |
|  |  | interpret codes, standards and regulations pertaining to preaction/deluge systems |
|  |  | interpret information pertaining to preaction/deluge systems found on drawings and specifications |
|  |  | identify tools and equipment relating to preaction/deluge systems, and describe their applications and procedures for use |
|  |  | identify ***types of*** ***preaction systems*** and describe their operating principles and ***applications*** |
|  |  | identify ***types of*** ***deluge systems*** and describe their operating principles and ***applications*** |
|  |  | identify ***trim*** components used on preaction/deluge valves, and describe their design variations and applications |
|  |  | identify types of alarms that a preaction/deluge valve will operate |
|  |  | identify ***supplemental fire detection systems***, and describe their operating principles and applications |
|  |  | identify the system controls required for preaction/deluge systems |
| D-13.04.02L | demonstrate knowledge of installation requirements and associated test procedures for preaction/deluge systems | describe the procedures used to install system controls required for preaction/deluge systems |
|  |  | explain the requirements for drainage of preaction/deluge systems |
|  |  | describe the procedures used to lay out and install preaction/deluge systems |
|  |  | describe the procedures used to trim preaction/deluge valves |
|  |  | describe the procedures used to service and maintain preaction/deluge systems |
|  |  | identify the requirements for functional and pressure testing of preaction/deluge systems and describe the associated procedures |

RANGE OF VARIABLES

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

***applications*** include: computer rooms, freezers, aircraft hangers, electrical rooms

***types of*** ***deluge systems*** include: deluge, high-speed deluge

***trim*** includes: solenoid actuators, diaphragm actuators

***supplemental fire detection systems*** include: electric, pneumatic, hydraulic

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| D-13.05 | Installs foam systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.05.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.05.02P | 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 NFPA standards |
| D-13.05.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.05.04P | determine and measure locations of auxiliary drains and requirements for valves | locations of auxiliary drains and requirements for valves are determined and measured according to NFPA standards to ensure accessibility for servicing and testing |
| D-13.05.05P | measure and fabricate ***piping*** | ***piping*** is measured and fabricated for installation according to drawings, NFPA standards, AHJ and site conditions |
| D-13.05.06P | install foam tanks | foam tanks are installed in close proximity to valves and to allow accessibility for refilling |
| D-13.05.07P | install ***valves and trim*** | ***valves and trim*** are installed according to manufacturers’ specifications and NFPA standards |
| D-13.05.08P | install ***distribution*** ***devices*** | ***distribution*** ***devices*** are installed according to manufacturers’ specifications and NFPA standards |
| D-13.05.09P | perform functional testing and meet intended ***design criteria*** | functional tests are performed to verify operation of components and meet intended ***design criteria*** |
| D-13.05.10P | fill foam concentrate tanks | foam concentrate tanks are filled according to manufacturers' specifications using ***equipment*** |
| D-13.05.11P | perform pressure tests | pressure tests are performed according to NFPA standards and AHJ |

RANGE OF VARIABLES

***components*** include: 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, high/low supervisory devices, pressure gauges

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

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

***distribution*** ***devices*** include: sprinklers, foam generators, nozzles

***design criteria*** includes: single interlock, double interlock, non-interlock and cross zoning, wet, deluge

***equipment*** includes: positive displacement pumps, siphons

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.05.01L | demonstrate knowledge of foam systems, their applications and operating principles | define terminology associated with foam systems |
|  |  | identify ***hazards*** and describe safe work practices pertaining to foam systems |
|  |  | interpret codes, standards and regulations pertaining to foam systems |
|  |  | interpret information pertaining to foam systems found on drawings and specifications |
|  |  | identify tools and equipment relating to foam systems, and describe their applications and procedures for use |
|  |  | identify types of foam systems and describe their operating principles and applications |
|  |  | identify the system controls required for foam systems |
|  |  | identify types of concentrate used in foam systems and describe their characteristics and ***applications*** |
|  |  | identify ***supplemental fire detection systems***, and describe their operating principles and applications |
| D-13.05.02L | demonstrate knowledge of ***installation requirements*** and associated test procedures for foam systems | describe the procedures used to lay out and install foam systems and components |
|  |  | describe the ***installation requirements*** of foam systems |
|  |  | describe the procedures used to fill foam concentrate tanks |
|  |  | explain the requirements for drainage of the system |
|  |  | explain the operation of a balanced pressure proportioning system |
|  |  | describe the procedures used to trim foam systems |
|  |  | explain the operation of a pressure proportioning tank with and without bladder |
|  |  | describe the procedures used to test and maintain foam systems |
|  |  | identify the requirements for pressure testing of foam systems and describe the associated procedures |

RANGE OF VARIABLES

***hazards*** include: environmental considerations, containment, disposal

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

***supplemental fire detection systems*** include: electric, pneumatic, hydraulic

***installation requirements*** include: materials, hangers, supports and bracing, system actuation, testing, manufacturers’ specifications

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| D-13.06 | Installs standpipe systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.06.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.06.02P | determine and measure location of piping and ***valves*** | location of piping and ***valves*** are determined and measured to allow for accessibility according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.06.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.06.04P | determine and measure fire hose valve locations | fire hose valve locations are determined and measured according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.06.05P | install fire hose valve | fire hose valve is installed with thread pattern that is compatible with the local fire department jurisdictional area |
| D-13.06.06P | install pressure reducing devices | pressure reducing devices are installed to limit pressure according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.06.07P | install stand-alone standpipe and combination standpipe systems | stand-alone standpipe and combination standpipe systems are installed according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.06.08P | install temporary standpipe systems | temporary standpipe systems are installed to ensure fire protection during construction, according to drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.06.09P | perform pressure test | pressure tests are performed according to NFPA standards and AHJ |

RANGE OF VARIABLES

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

***components*** include: fire department connections, drains, control valves, regulated air supply, QODs, auxiliary drains, high/low supervisory devices, pressure gauges, hose valves, pressure regulating devices

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.06.01L | demonstrate knowledge of standpipe and hose systems, their applications and operating principles | define terminology associated with standpipe and hose systems |
|  |  | identify hazards and describe safe work practices pertaining to standpipe and hose systems |
|  |  | interpret codes, standards and regulations pertaining to standpipe and hose systems |
|  |  | interpret code requirements pertaining to flushing connections in piping systems |
|  |  | interpret information pertaining to standpipe and hose systems found on drawings and specifications |
|  |  | identify tools and equipment relating to standpipe and hose systems, and describe their applications and procedures for use |
|  |  | identify the ***classes of standpipe systems***, and describe their characteristics and applications |
|  |  | identify ***types of*** ***standpipe systems***, and describe their operating principles, characteristics and applications |
|  |  | identify the ***factors to consider*** and the requirements to determine standpipe system design |
|  |  | identify types of hoses, hose valves and associated fittings, and describe their characteristics and applications |
|  |  | identify types of hose cabinets and hose stations |
|  |  | identify types of hose spray nozzles and describe their applications |
| D-13.06.02L | demonstrate knowledge of installation requirements and associated test procedures for standpipe systems | describe the procedures used to lay out standpipe and hose systems |
|  |  | describe the procedures used to install hose cabinets and stations, and associated equipment |
|  |  | describe the procedures used to install hose spray nozzles |
|  |  | describe the procedures used to test and maintain standpipe systems |
|  |  | identify the requirements for pressure testing of standpipe and hose systems and describe the associated procedures |

RANGE OF VARIABLES

***classes of standpipe systems*** include: class I, class II, class III

***types of*** ***standpipe systems*** include*:* wet pipe, dry pipe, manual, automatic, combined, semi-automatic dry

***factors to consider*** for system design include: pipe sizing, flow rate, pressures, hose valve location, hose thread connection, AHJ, gauge location

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| D-13.07 | Installs water mist and hybrid systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-13.07.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-13.07.02P | 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 NFPA standards |
| D-13.07.03P | determine and measure locations and requirements of ***components*** | locations and requirements of ***components*** are determined and measured according to manufacturers’ specifications, drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.07.04P | measure and fabricate ***piping*** | ***piping*** is measured and fabricated for installation according to drawings, NFPA standards, AHJ and site conditions |
| D-13.07.05P | connect piping to water supply | piping is connected to water supply using ***methods*** according to manufacturers’ specifications, drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.07.06P | install ***auxiliary*** ***devices*** | ***auxiliary*** ***devices*** are installed according to NFPA standards to ensure accessibility for servicing and testing |
| D-13.07.07P | flush system | system is flushed to prevent plugging of nozzles according to manufacturers’ specifications, drawings, project specifications, site conditions, AHJ and NFPA standards |
| D-13.07.08P | perform functional tests and meet intended ***design criteria*** | functional tests are performed to verify operation of components and meet intended ***design criteria*** |
| D-13.07.09P | perform pressure tests | pressure tests are performed according to NFPA standards and AHJ |

RANGE OF VARIABLES

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

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

***methods*** include: flanged, welded, grooved, threaded, compression

***auxiliary*** ***devices*** include: nozzles, emitters

***design criteria*** includes: manufacturers’ discharge, time limitations

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-13.07.01L | demonstrate knowledge of water mist and hybrid systems, their applications and operating principles | define terminology associated with water mist and hybrid systems |
|  |  | identify hazards and describe safe work practices pertaining to water mist and hybrid systems |
|  |  | interpret codes, standards and regulations pertaining to water mist and hybrid systems |
|  |  | interpret information pertaining to water mist and hybrid systems found on drawings and specifications |
|  |  | identify tools and equipment relating to water mist and hybrid systems, and describe their applications and procedures for use |
|  |  | identify ***types of water mist and hybrid systems***, and describe their operating principles, characteristics and applications |
| D-13.07.02L | demonstrate knowledge of ***installation requirements*** for water mist and hybrid systems | describe the procedures used to lay out and install water mist and hybrid systems and components |
|  |  | identify system controls for water mist and hybrid systems and their ***installation requirements*** |
|  |  | explain the requirements for drainage of water mist and hybrid systems |
|  |  | identify the requirements for pressure testing of water mist and hybrid systems and describe the associated procedures |

RANGE OF VARIABLES

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

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

TASK D-14 Installs specialty fire suppression systems

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 a degree of specialization and unique skill sets among sprinkler fitters.

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| D-14.01 | Installs dry and wet chemical, clean agent and carbon dioxide systems |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-14.01.01P | select pipe and fittings | pipe and fittings are selected to match ***manufacturers' specifications*** |
| D-14.01.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| D-14.01.03P | remove possible obstructions | possible obstructions are removed in pipe by reaming, cleaning and blowing out |
| D-14.01.04P | install clamps | clamps are installed to prevent pipe movement during discharge of extinguishing agent according to NFPA standards |
| D-14.01.05P | measure and fabricate piping | piping is measured and fabricated to meet site conditions |
| D-14.01.06P | measure and modify system piping | system piping is measured and modified according to ***manufacturers’ specifications*** and site conditions |
| D-14.01.07P | install piping and nozzles | piping and nozzles are installed according to drawings and specifications to ensure equal discharge, and according to NFPA standards |
| D-14.01.08P | 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 NFPA standards |
| D-14.01.09P | install activation devices | activation devices are installed according to ***manufacturers' specifications*** and NFPA standards |
| D-14.01.10P | pressure test system | system is pressure tested according to ***manufacturers’ specifications*** |
| D-14.01.11P | assist in verification | controls and actuators are verified by qualified personnel |

RANGE OF VARIABLES

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

***tools and equipment*** include: swabs, acetone, rags

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-14.01.01L | demonstrate knowledge of wet and dry chemical, clean agent and carbon dioxide systems and their operation and characteristics | define terminology associated with wet and dry chemical, clean agent and carbon dioxide systems |
|  |  | interpret information pertaining to wet and dry chemical, clean agent and carbon dioxide systems found on drawings and specifications |
|  |  | identify ***tools and equipment*** relating to wet and dry chemical, clean agent and carbon dioxide systems, and describe their applications and procedures for use |
|  |  | identify ***types*** ***of*** wet and dry chemical, clean agent and ***carbon dioxide systems***, and describe their characteristics, operation and applications |
|  |  | describe the operating principles and applications of wet and dry chemical, clean agent and carbon dioxide systems |
|  |  | describe ***fixed pipe systems*** |
|  |  | identify the ***components*** of wet and dry chemical, clean agent and carbon dioxide systems and describe their purpose and operation |
|  |  | explain the properties of carbon dioxide |
|  |  | identify the extinguishing properties of wet and dry chemical, clean agent and carbon dioxide systems |
|  |  | describe the procedures used to calculate the quantity of carbon dioxide extinguishing agent required for a system |
|  |  | identify the factors to consider and limitations pertaining to halon systems |
|  |  | identify types of pipe used for specialty fire suppression systems |
|  |  | identify clean agent system media and their properties |
|  |  | identify containment requirements for clean agent systems |
|  |  | define the limited extinguishing ability of clean agent and carbon dioxide systems |
|  |  | identify ***applications*** of clean agent and carbon dioxide systems |
|  |  | identify ***hazards*** and describe safe work practices pertaining to wet and dry chemical, clean agent and carbon dioxide systems |
| D-14.01.02L | demonstrate knowledge of installation of wet and dry chemical, clean agent and carbon dioxide systems | identify the installation requirements for wet and dry chemical, and carbon dioxide systems and ***components*** |
|  |  | interpret codes, standards, regulations and manufacturers’ specifications pertaining to wet and dry chemical, clean agent and carbon dioxide systems |
|  |  | describe the procedures used to install wet and dry chemical, clean agent and carbon dioxide systems and components |
| D-14.01.03L | demonstrate knowledge of inspection, and testing of wet and dry chemical, clean agent and carbon dioxide systems | identify the requirements of inspection and acceptance testing of wet and dry chemical, clean agent and carbon dioxide systems |
|  |  | explain the liabilities and responsibilities for the inspection and testing of wet and dry chemical, clean agent and carbon dioxide systems |
| D-14.01.04L | demonstrate knowledge of procedures used to service, maintain and remove wet and dry chemical, clean agent and carbon dioxide systems | describe the procedures used to service, maintain and remove wet and dry chemical, clean agent and carbon dioxide systems |

RANGE OF VARIABLES

***tools and equipment*** include: swabs, acetone, rags

***types of carbon dioxide systems*** include: low pressure, high pressure

***fixed pipe systems*** include: total flooding, local application

***components*** include: 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)

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

***hazards*** include: handling of materials and cylinders, accidental discharge

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| D-14.02 | Installs portable extinguishers |

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| **Essential Skills** | Document Use, Numeracy, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-14.02.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| D-14.02.02P | determine type and location of extinguisher | type and location of extinguisher is determined according to drawings, specifications and AHJ |
| D-14.02.03P | install extinguisher and cabinets | extinguisher and cabinets are installed according to drawings, NFPA standards and AHJ |
| D-14.02.04P | confirm that extinguishers are fully charged | extinguishers are confirmed to be fully charged with pins and seals in place along with a currently dated inspection tag which is stamped by qualified personnel |

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-14.02.01L | demonstrate knowledge of procedures and requirements to install portable fire extinguishers | define terminology associated with portable fire extinguishers |
|  |  | identify hazards and describe safe work practices pertaining to portable fire extinguishers |
|  |  | interpret codes, standards and regulations pertaining to portable fire extinguishers |
|  |  | interpret information pertaining to portable fire extinguishers found on drawings and specifications |
|  |  | identify tools and equipment relating to portable fire extinguishers, and describe their applications and procedures for use |
|  |  | identify classes and ***types of portable fire extinguishers***, and describe their characteristics, operation and applications |
|  |  | identify the components of portable fire extinguishers |
|  |  | identify the installation requirements and procedures for portable fire extinguishers and cabinets |
|  |  | identify ***installation locations*** for portable fire extinguishers |
|  |  | describe the procedures used to operate portable fire extinguishers |
|  |  | explain the liabilities and responsibilities for the installation of portable fire extinguishers |

RANGE OF VARIABLES

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

***installation locations*** include: cabinet, wall mount, wheeled

TASK D-15 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.

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| D-15.01 | Installs wet and dry pilot lines |

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| **Essential Skills** | Document Use, Thinking, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-15.01.01P | 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-15.01.02P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-15.01.03P | install pilot lines | pilot lines are installed according to ***parameters*** |
| D-15.01.04P | space pilot line and fixed temperature HADs | pilot line and fixed temperature HADs are spaced according to NFPA standards and manufacturers’ specifications |
| D-15.01.05P | connect pilot lines | pilot lines are connected to valve trim according to manufacturers’ specifications |
| D-15.01.06P | perform pressure test | pressure test for pilot lines is performed according to NFPA standards |

RANGE OF VARIABLES

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-15.01.01L | demonstrate knowledge of the procedures used to install, test and maintain wet and dry pilot lines and their associated pilot line detectors | define terminology associated with wet and dry pilot lines |
|  |  | identify hazards and describe safe work practices pertaining to wet and dry pilot lines |
|  |  | interpret codes, standards and regulations pertaining to wet and dry pilot lines |
|  |  | interpret information pertaining to wet and dry pilot lines, found on drawings and specifications |
|  |  | identify tools and equipment relating to wet and dry pilot lines, and describe their applications and procedures for use |
|  |  | identify types of wet and dry pilot lines and their components, and describe their characteristics, parameters and applications |
|  |  | describe the procedures used to install, test and maintain wet and dry pilot lines |

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| D-15.02 | Installs heat-actuated devices (HADs) (NOT COMMON CORE) |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-15.02.01P | determine location of ***HADs*** | location of ***HADs*** is determined according to manufacturers' specifications and AHJ |
| D-15.02.02P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-15.02.03P | mount releasing panel | releasing panel is mounted in proximity to releasing devices to facilitate actuation of system |
| D-15.02.04P | install piping, tubing and wire | piping, tubing and wire are installed in area being protected according to manufacturers' specifications, AHJ and NFPA standards |
| D-15.02.05P | attach linear heat detection wire | linear heat detection wire is attached according to manufacturers' specifications |
| D-15.02.06P | test ***HADs*** | ***HADs*** are tested according to manufacturers’ specifications |

RANGE OF VARIABLES

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

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-15.02.01L | demonstrate knowledge of the procedures used to install, test and maintain HADs and their associated components | define terminology associated with HADs |
|  |  | identify hazards and describe safe work practices pertaining to HADs |
|  |  | interpret codes, standards and regulations pertaining to HADs |
|  |  | interpret information pertaining to HADs, found on drawings and specifications |
|  |  | identify tools and equipment relating to HADs, and describe their applications and procedures for use |
|  |  | identify ***types of HADs*** and describe their characteristics, ***parameters*** and applications |
|  |  | describe the procedures used to install, test and maintain HADs |

RANGE OF VARIABLES

***types of*** ***HADs*** include: fixed temperature, rate of rise detectors, linear heat detector

***parameters*** of HADs include: spacing, temperature, type

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| D-15.03 | Installs spark detection systems (NOT COMMON CORE) |

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| **Essential Skills** | Numeracy, Document Use, Thinking |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-15.03.01P | determine location of system | location of system is determined according to manufacturers' specifications, site conditions, NFPA standards and AHJ |
| D-15.03.02P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-15.03.03P | fasten spark detector to structure | spark detector is fastened to structure to ensure detection of sparks and flame, and to prevent movement |
| D-15.03.04P | assemble system ***components*** | system ***components*** are assembled according to manufacturers’ specifications, NFPA standards and AHJ |
| D-15.03.05P | install piping | piping is installed to spark detection system according to manufacturers’ specifications, NFPA standards and AHJ |
| D-15.03.06P | verify operation | operation is verified and calibrated according to site conditions, manufacturers’ specifications and AHJ |

RANGE OF VARIABLES

***components*** include: solenoids, nozzles, spark detector sensors

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-15.03.01L | demonstrate knowledge of the procedures used to install, test and maintain spark detection systems and their associated ***components*** | define terminology associated with spark detection systems |
|  |  | identify hazards and describe safe work practices pertaining to spark detection systems |
|  |  | interpret codes, standards and regulations pertaining to spark detection systems |
|  |  | interpret information pertaining to spark detection systems, found on drawings and specifications |
|  |  | identify tools and equipment relating to spark detection systems, and describe their applications and procedures for use |
|  |  | identify types of spark detection systems and their ***components*** and describe their characteristics, ***parameters*** and applications |
|  |  | describe the procedures used to install, test and maintain spark detection systems |

RANGE OF VARIABLES

***components*** include: solenoids, nozzles, spark detectors

***parameters*** of spark detection systemsinclude: spacing, location

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| D-15.04 | Installs air sampling systems (NOT COMMON CORE) |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-15.04.01P | determine location of system | location of system is determined according to drawings, site conditions and manufacturers' specifications |
| D-15.04.02P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-15.04.03P | connect components | components of air sampling system are connected according to manufacturers' specifications and AHJ |
| D-15.04.04P | install air sampling pipe | air sampling pipe is installed to detect particulate concentration in area of application according to manufacturers' specifications and AHJ |
| D-15.04.05P | connect and terminate air sampling system | air sampling system is connected to, and terminated from sampling/activation panel according to manufacturers' specifications and AHJ |

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-15.04.01L | demonstrate knowledge of the procedures used to install, test and maintain air sampling systems and their associated ***components*** | define terminology associated with air sampling systems |
|  |  | identify hazards and describe safe work practices pertaining to air sampling systems |
|  |  | interpret codes, standards and regulations pertaining to air sampling systems |
|  |  | interpret information pertaining to air sampling systems, found on drawings and specifications |
|  |  | identify tools and equipment relating to air sampling systems, and describe their applications and procedures for use |
|  |  | identify types of air sampling systems and describe their characteristics, parameters and applications |
|  |  | describe the procedures used to install, test and maintain air sampling systems |

RANGE OF VARIABLES

***components*** include: sampling/activation panels, tubing, sampling point

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| D-15.05 | Installs electrical detection systems (NOT COMMON CORE) |

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| **Essential Skills** | Thinking, Document Use, Numeracy |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-15.05.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-15.05.02P | install smoke and heat detectors | smoke and heat detectors are installed according to job and site requirements, manufacturers’ specifications and AHJ |
| D-15.05.03P | verify operation of smoke and heat detectors and ensure connections | operation of smoke and heat detectors are verified according to manufacturers’ specifications, ***codes and standards*** and AHJ |

RANGE OF VARIABLES

***codes and standards*** include: Canadian Standards for Fire Alarm Systems (CAN/ULC), NFPA standards

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|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-15.05.01L | demonstrate knowledge of the procedures used to install, test and maintain electrical detection systems and their associated ***components*** | define terminology associated with electrical detection systems |
|  |  | identify hazards and describe safe work practices pertaining to electrical detection systems |
|  |  | interpret ***codes, standards*** and regulations pertaining to electrical detection systems |
|  |  | interpret information pertaining to electrical detection systems, found on drawings and specifications |
|  |  | identify tools and equipment relating to electrical detection systems, and describe their applications and procedures for use |
|  |  | identify ***types of electrical detection systems*** and describe their characteristics, parameters and applications |
|  |  | describe the procedures used to install, test and maintain electrical detection systems |

RANGE OF VARIABLES

***components*** include: smoke detectors, heat detectors, releasing panels

***codes and standards*** include: CAN/ULC, NFPA standards

***types of electrical detection systems*** include: single zone, cross zone, addressable, conventional

TASK D-16 Installs signal-initiating devices

TASK DESCRIPTOR

Alarm-initiating devices provide electrical signals to the local alarms which warn of the activation of the fire protection system. Supervisory initiating devices provide notification of trouble or impairment of the fire protection system.

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| D-16.01 | Installs alarm-initiating devices |

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| **Essential Skills** | Thinking, Document Use, Working with Others |

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

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|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-16.01.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-16.01.02P | install device | device is installed according to pipe size, system type and location to allow for replacement and repair according to site conditions, manufacturers’ specifications and AHJ |
| D-16.01.03P | determine location of alarm-initiating devices | location of alarm-initiating devices is determined according to drawings and NFPA standards and manufacturers’ specifications |
| D-16.01.04P | attach devices to piping | devices are attached to piping by ***methods*** according to manufacturers’ specifications |
| D-16.01.05P | install a means of ***testing*** | a means of ***testing*** isinstalled according to manufacturers’ specifications, NFPA standards and AHJ |
| D-16.01.06P | verify operation of devices | devices are field tested and adjusted according to manufacturers’ specifications, NFPA standards and AHJ |

RANGE OF VARIABLES

***methods*** include: using threaded connections, using clamps

***testing*** includes: a test and drain valve or an alarm test valve, inspectors’ test connection

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-16.01.01L | demonstrate knowledge of the procedures and requirements to install, test and maintain alarm-initiating devices | define terminology associated with alarm-initiating devices |
|  |  | identify ***types of*** ***alarm-initiating devices*** and describe their characteristics, parameters and applications |
|  |  | identify hazards and describe safe work practices pertaining to alarm-initiating devices |
|  |  | interpret codes, standards and regulations pertaining to alarm-initiating devices |
|  |  | interpret information pertaining to alarm-initiating devices found on drawings and specifications |
|  |  | identify tools and equipment relating to alarm-initiating devices and describe their applications and procedures for use |
|  |  | describe the procedures used to install, test and maintain alarm-initiating devices |
|  |  | identify installation locations for alarm-initiating devices |
|  |  | describe operation and applications of alarm-initiating devices |

RANGE OF VARIABLES

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

|  |  |
| --- | --- |
| D-16.02 | Installs supervisory-initiating devices |

|  |  |
| --- | --- |
| **Essential Skills** | Thinking, Document Use, Working with Others |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| D-16.02.01P | select ***supervisory-initiating device*** | ***supervisory-initiating device*** is selected according to components being supervised, system type and location |
| D-16.02.02P | determine location of ***supervisory-initiating devices*** | location of ***supervisory-initiating devices*** is determined according to site conditions, manufacturers' specifications and drawings |
| D-16.02.03P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| D-16.02.04P | attach ***supervisory-initiating devices*** | ***supervisory-initiating devices*** are attached to piping and components according to manufacturers’ specifications, site conditions and AHJ |
| D-16.02.05P | verify operation of ***supervisory-initiating devices*** | ***supervisory-initiating devices*** are field tested and adjusted according to manufacturers’ specifications, NFPA standards, site conditions and AHJ |

RANGE OF VARIABLES

***supervisory-initiating devices*** include: low air pressure, low water pressure, tamper (switches)

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| D-16.02.01L | demonstrate knowledge of procedures and requirements to install, test and maintain supervisory-initiating devices | define terminology associated with supervisory-initiating devices |
|  |  | identify hazards and describe safe work practices pertaining to supervisory-initiating devices |
|  |  | interpret codes, standards and regulations pertaining to supervisory-initiating devices |
|  |  | interpret information pertaining to supervisory-initiating devices, found on drawings and specifications |
|  |  | identify tools and equipment relating to supervisory-initiating devices, and describe their applications and procedures for use |
|  |  | identify ***types of*** ***supervisory-initiating devices*** and describe their characteristics, parameters and applications |
|  |  | describe the procedures used to install, test and maintain supervisory-initiating devices |
|  |  | describe the operation and applications of supervisory-initiating devices |

RANGE OF VARIABLES

***types of*** ***supervisory-initiating devices*** include: low air pressure, low water pressure, tamper (switches)

MAJOR WORK ACTIVITY E

Inspects, tests and maintains (ITM) fire protection systems

TASK E-17 Maintains and repairs fire protection systems

TASK DESCRIPTOR

Sprinkler fitters perform maintenance and repairs on all types of fire protection systems to prevent malfunctions or failures.

|  |  |
| --- | --- |
| E-17.01 | Troubleshoots fire protection systems |

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| --- | --- |
| **Essential Skills** | Oral Communication, Document Use, Thinking |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| E-17.01.01P | identify potential problems | problem is located by examining fire alarm panel, speaking with owner’s representative, and performing visual inspection for abnormalities |
| E-17.01.02P | determine probable cause | symptoms of malfunction are identified and analyzed in problem area to determine probable cause |
| E-17.01.03P | determine required corrective action | required corrective action is determined to reinstate system’s integrity and operation |
| E-17.01.04P | inform owner and obtain permission | owner is informed of required action and permission is obtained prior to initiating repair |
| E-17.01.05P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| E-17.01.01L | demonstrate knowledge of procedures and requirements used to troubleshoot fire protection systems and their components | define terminology associated with fire protection systems and their components |
|  |  | identify hazards and describe safe work practices pertaining to the troubleshooting of fire protection systems and their components |
|  |  | interpret codes, standards and regulations pertaining to fire protection systems and their components |
|  |  | identify tools and equipment relating to troubleshooting fire protection systems, and describe their applications and procedures for use |
|  |  | explain the liabilities and responsibilities for the troubleshooting of fire protection systems |
|  |  | identify common causes of fire protection system failures |
|  |  | identify the testing and troubleshooting methods for signaling devices |
|  |  | describe the procedures used to shut down and reactivate sprinkler systems and associated alarms and supervisory devices |
|  |  | describe the procedures used to troubleshoot fire protection systemsand components |
|  |  | identify the ***classifications of needed corrections and repairs***, and explain the associated requirements |
| E-17.01.02L | demonstrate knowledge of the relationship between sprinkler systems and fire panels | identify ***types of fire*** ***panels*** and ***signals***, and describe their operation and purpose |
|  |  | describe the operation of release devices |

RANGE OF VARIABLES

***classifications of needed corrections and repairs*** include: impairment (pre-plan and emergency), critical deficiency, noncritical deficiency

***types of fire panels*** include: alarm, release, annunciator

***signals*** include: trouble, alarm, supervisory

|  |  |
| --- | --- |
| E-17.02 | Repairs deficiencies |

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| --- | --- |
| **Essential Skills** | Document Use, Thinking, Oral Communication |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| E-17.02.01P | notify owner’s representative | owner’s representative is notified to prevent false fire service responses and upon completion of work |
| E-17.02.02P | disable and disarm system | system is disabled and disarmed within ***determined parameters*** to allow for repairs |
| E-17.02.03P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| E-17.02.04P | repair or replace deficient components | deficient components are repaired or replaced based on nature of problem |
| E-17.02.05P | take ***corrective actions*** | ***corrective actions*** are taken to return system to normal operational status |
| E-17.02.06P | verify repair | repair is verified using appropriate ***testing procedures*** |

RANGE OF VARIABLES

***determined parameters*** include: permission by owner/owner representative, AHJ

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

***testing procedures*** include: functional testing of valves, initiation of devices, performing flow, hydrostatic and pneumatic tests

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| E-17.02.01L | demonstrate knowledge of procedures and requirements used to repair fire protection systems and their components | define terminology associated with fire protection systems and their components |
|  |  | identify hazards and describe safe work practices pertaining to fire protection systems and their components |
|  |  | interpret codes, standards and regulations pertaining to the repair of fire protection systems and their components |
|  |  | identify tools and equipment relating to the repair of fire protection systems, and describe their applications and procedures for use |
|  |  | explain the liabilities and responsibilities for the repair of fire protection systems |
|  |  | identify requirements for inspecting and testing systems that have been altered or repaired |
|  |  | identify the testing requirements for signaling devices |
|  |  | describe the procedures used to shut down and reactivate sprinkler systems and associated alarms and supervisory devices |
|  |  | describe the procedures used to repair fire protection systemsand components |
|  |  | describe the procedures used to repair fire pump units and components |
|  |  | describe the procedures used to repair hydrants and fire department connections |
|  |  | identify the ***classifications of needed corrections and repairs***, and explain the associated requirements |
| E-17.02.02L | demonstrate knowledge of the relationship between sprinkler systems and fire panels | identify ***types of*** ***fire*** ***panels*** and ***signals***, and describe their operation and purpose |
|  |  | describe the operation of release devices |

RANGE OF VARIABLES

***classifications of needed corrections and repairs*** include: impairment (pre-plan and emergency), critical deficiency, noncritical deficiency

***types of fire panels*** include: alarm, release, annunciator

***signals*** include: trouble, alarm, supervisory

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| E-17.03 | Performs scheduled maintenance |

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| **Essential Skills** | Document Use, Continuous Learning, Digital Technology |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| E-17.03.01P | notify owner’s representative | owner’s representative is notified to prevent false fire service responses and upon completion of work |
| E-17.03.02P | disable and disarm system | system is disabled and disarmed within ***determined parameters*** to allow for maintenance |
| E-17.03.03P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| E-17.03.04P | perform ***routine maintenance procedures*** | ***routine maintenance procedures*** are performed according to manufacturers’ specifications, NFPA standards and scope of work |
| E-17.03.05P | inform owner’s representative of any deficiencies or impairments | owner’s representative is informed of any deficiencies or impairments |

RANGE OF VARIABLES

***determined parameters*** include: permission by owner/owner representative, AHJ

***routine maintenance procedures*** include: checking for blockage or frost plugs, changing desiccant in air dryers, cleaning strainers, investigating obstructions, draining low points on dry and preaction systems, performing lubrication and corrosion prevention measures

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| E-17.03.01L | demonstrate knowledge of procedures used to maintain fire protection systems and their components | define terminology associated with maintenance of fire protection systems and their components |
|  |  | identify hazards and describe safe work practices pertaining to the maintenance of fire protection systems and their components |
|  |  | interpret codes, standards and regulations pertaining to the maintenance of fire protection systems and their components |
|  |  | identify tools and equipment relating to maintenance of fire protection systems, and describe their applications and procedures for use |
|  |  | explain the liabilities and responsibilities for the maintenance of fire protection systems |
|  |  | identify frequency of maintenance of fire protection systems and components |
|  |  | identify common causes of fire protection system failures |
|  |  | identify the testing requirements for signaling devices |
|  |  | describe the procedures used to shut down and reactivate sprinkler systems and associated alarms and supervisory devices |
|  |  | describe the ***procedures*** used to maintain fire protection systems and components |
|  |  | describe the ***procedures*** used to maintain fire pump units and components |
|  |  | describe the ***procedures*** used to maintain hydrants and fire department connections |
|  |  | identify the ***classifications of needed corrections and repairs***, and explain the associated requirements |
| E-17.03.02L | demonstrate knowledge of the relationship between sprinkler systems and fire panels | identify ***types of*** ***fire*** ***panels*** and ***signals***, and describe their operation and purpose |
|  |  | describe the operation of release devices |

RANGE OF VARIABLES

***procedures*** include: checking for blockage or frost plugs, changing desiccant in air dryers, cleaning strainers, investigating obstructions, draining low points on dry and preaction systems, performing lubrication and corrosion prevention measures

***classifications of needed corrections and repairs*** include: impairment (pre-plan and emergency), critical deficiency, noncritical deficiency

***types of fire panels*** include: alarm, release, annunciator

***signals*** include: trouble, alarm, supervisory

TASK E-18 Inspects and tests fire protection systems

TASK DESCRIPTOR

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

|  |  |
| --- | --- |
| E-18.01 | Performs scheduled tests |

|  |  |
| --- | --- |
| **Essential Skills** | Document Use, Writing, Digital Technology |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| E-18.01.01P | notify owner’s representative | owner’s representative is notified of scheduled test and completion of work |
| E-18.01.02P | select and use ***tools and equipment*** | ***tools and equipment*** are selected and used according to scope of work |
| E-18.01.03P | disable and disarm fire protection system | fire protection system is disabled and disarmed within ***determined parameters*** to allow for testing |
| E-18.01.04P | perform required tests | required tests are performed on fire protection system components to ensure that they work within established parameters |
| E-18.01.05P | complete all applicable documentation | documentation is completed according to NFPA standards, manufacturers’ specifications, AHJ and company policies |

RANGE OF VARIABLES

***tools and equipment*** include: pitot gauges, refractometers, tachometers, calibrated pressure gauges, diffusers, flowmeters, backflow test kits, multimeters

***determined parameters*** include: permission by owner/owner representative, AHJ

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| E-18.01.01L | demonstrate knowledge of procedures and requirements used to test fire protection systems and their components | define terminology associated with testing of fire protection systems and their components |
|  |  | identify hazards and describe safe work practices pertaining to the testing of fire protection systems and their components |
|  |  | interpret codes, standards and regulations pertaining to the testing of fire protection systems and their components |
|  |  | identify ***tools and equipment*** relating to testing of fire protection systems, and describe their applications and procedures for use |
|  |  | explain the liabilities and responsibilities for the testing of fire protection systems |
|  |  | identify frequency of testing of fire protection systems and components |
|  |  | identify requirements for testing fire protection systems that have been altered or repaired |
|  |  | identify the testing requirements for signaling devices |
|  |  | describe the procedures used to shut down and reactivate sprinkler systems and associated alarms and supervisory devices |
|  |  | describe the procedures used to test fire protection systemsand components |
|  |  | describe the procedures used to test fire pump units and components |
|  |  | describe the procedures used to test hydrants and fire department connections for operation and drainage |
|  |  | describe the procedures used to test backflow prevention devices |
|  |  | identify the ***classifications of needed corrections and repairs***, and explain the associated requirements |

|  |  |  |
| --- | --- | --- |
| E-18.01.02L | demonstrate knowledge of the relationship between sprinkler systems and fire panels | identify ***types of*** ***fire*** ***panels*** and ***signals***, and describe their operation and purpose |
|  |  | describe the operation of release devices |

RANGE OF VARIABLES

***tools and equipment*** include: pitot gauges, refractometers, tachometers, calibrated pressure gauges, diffusers, flowmeters, backflow test kits, multimeters

***classifications of needed corrections and repairs*** include: impairment (pre-plan and emergency), critical deficiency, noncritical deficiency

***types of panels*** include: alarm, release, annunciator

***signals*** include: trouble, alarm, supervisory

|  |  |
| --- | --- |
| E-18.02 | Performs scheduled inspections |

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| --- | --- |
| **Essential Skills** | Document Use, Writing, Digital Technology |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| E-18.02.01P | notify owner’s representative | owner’s representative is notified of scheduled inspection |
| E-18.02.02P | select and use inspection documents | inspection documents are selected and used according to NFPA standards, owner’s instructions and company policies |
| E-18.02.03P | select and use tools and equipment | tools and equipment are selected and used according to scope of work |
| E-18.02.04P | identify abnormalities and deficiencies | abnormalities and deficiencies are identified by performing visual inspections and referring to previous reports |

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| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| E-18.02.01L | demonstrate knowledge of the procedures and requirements to perform scheduled inspections of fire protection systems and their components | define terminology associated with inspection of fire protection systems and their components |
|  |  | identify hazards and describe safe work practices pertaining to the inspection of fire protection systems and their components |
|  |  | interpret codes, standards and regulations pertaining to the inspection of fire protection systems and their components |
|  |  | identify tools and equipment relating to inspection of fire protection systems, and describe their applications and procedures for use |
|  |  | explain the liabilities and responsibilities for the inspection |
|  |  | identify frequency of inspection of fire protection systems and components |
|  |  | identify common causes of fire protection system failures |
|  |  | describe the procedures used to inspect, fire protection systemsandcomponents |
|  |  | describe the procedures used to inspect fire pump units and components |
|  |  | describe the procedures used to inspect hydrants and fire department connections for operation and drainage |
|  |  | identify the ***classifications of needed corrections and repairs***, and explain the associated requirements |
|  |  | identify the requirements for inspecting backflow preventers |
| E-18.02.02L | demonstrate knowledge of the relationship between sprinkler systems and fire panels | identify ***types of*** ***fire*** ***panels*** and ***signals***, and describe their operation and purpose |
|  |  | describe the operation of release devices |

RANGE OF VARIABLES

***classifications of needed corrections and repairs*** include: impairment (pre-plan and emergency), critical deficiency, noncritical deficiency

***types of fire panels*** include: alarm, release, annunciator

***signals*** include: trouble, alarm, supervisory

|  |  |
| --- | --- |
| E-18.03 | Inspects portable fire extinguishers |

|  |  |
| --- | --- |
| **Essential Skills** | Document Use, Writing, Digital Technology |

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

|  |  |  |
| --- | --- | --- |
|  | SKILLS | |
|  | **Performance Criteria** | **Evidence of Attainment** |
| E-18.03.01P | select and use tools and equipment | tools and equipment are selected and used according to scope of work and manufacturers’ specifications |
| E-18.03.02P | perform visual inspection of condition of ***exterior components*** | visual inspection is performed to ensure that ***exterior components*** are in place, secured and free from physical damage |
| E-18.03.03P | verify that hoses and nozzles are intact | hoses and nozzles are intact and clear of obstructions |
| E-18.03.04P | verify that required maintenance and hydrostatic tests are up-to-date | visual verification of prior maintenance and testing dates is documented |
| E-18.03.05P | verify gauge pressure and cylinder weight | gauge pressure and cylinder weight is verified to ensure it is within acceptable operating parameters |
| E-18.03.06P | determine type and location of fire extinguishers | type and location of fire extinguishers match the hazards of the area |
| E-18.03.07P | document inspection | inspection is documented on equipment tags according to NFPA standards and company policies |

RANGE OF VARIABLES

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

|  |  |  |
| --- | --- | --- |
|  | KNOWLEDGE | |
|  | **Learning Outcomes** | **Learning Objectives** |
| E-18.03.01L | demonstrate knowledge of procedures and requirements to inspect portable fire extinguishers | define terminology associated with portable fire extinguishers |
|  |  | identify hazards and describe safe work practices pertaining to portable fire extinguishers |
|  |  | interpret codes, standards and regulations pertaining to portable fire extinguishers |
|  |  | interpret information pertaining to portable fire extinguishers found on drawings and specifications |
|  |  | identify tools and equipment relating to portable fire extinguishers, and describe their applications and procedures for use |
|  |  | identify classes and types of portable fire extinguishers, and describe their characteristics, operation and applications |
|  |  | identify the components of portable fire extinguishers |
|  |  | describe the procedures used to inspect portable fire extinguishers |
|  |  | explain the liabilities and responsibilities for the inspection of portable fire extinguishers |
|  |  | identify frequency of inspection of portable fire extinguishers |

APPENDIX A

ACRONYMS

|  |  |
| --- | --- |
| AHJ | authority having jurisdiction |
| ANSI | American National Standards Institute |
| CAN/ULC | Canadian ULC Standard |
| CMSA | control mode specific application |
| CPVC | chlorinated poly vinyl chloride |
| CSA | Canadian Standards Association |
| DCVA | double check valve assembly |
| ESFR | early suppression fast response |
| FM | Factory Mutual |
| HAD | heat-actuated device |
| ITM | inspection, testing and maintenance |
| MAPP | methylacetylene-propadiene propane |
| NBC | National Building Code |
| NFPA | National Fire Protection Association |
| NPT | National Pipe Thread |
| NST | National Standard Thread |
| OH&S | Occupational Health and Safety |
| OS&Y | outside stem & yoke |
| PIV | post indicator valve |
| PPE | personal protective equipment |
| PVC | polyvinyl chloride |
| QOD | quick opening device |
| RP (RPBA) | reduced pressure backflow assembly |
| SDS | safety data sheets |
| TDG | transportation of dangerous goods |
| ULC | Underwriters Laboratories of Canada |
| WHMIS | Workplace Hazardous Materials Information System |

APPENDIX B

TOOLS AND EQUIPMENT

Hand Tools / Outils manuels

|  |  |
| --- | --- |
| adjustable wrenches (various sizes) | clés à ouverture réglable (de tailles diverses) |
| benders (pipe and tube) | cintreuses (pour tuyaux et tubes) |
| caulking gun | pistolets à calfeutrer |
| centre finder/contour marker | centreurs |
| centre punch | pointeaux centreurs |
| 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 | filières et peignes à fileter |
| drop-in anchor setting tool | outils d’ancrage à impact |
| drywall saw | scies passe-partout |
| extension cord | rallonges électriques |
| files (flat, half-round, rat-tail, bastard) | limes (plates, demi-ronde, queue de rat, bâtarde) |
| fitting brushes | brosses pour raccords |
| flaring tool | évaseurs |
| flashlight | lampes de poche |
| gasket cutter | coupe-garnitures |
| grease gun | pistolets graisseurs |
| hacksaw | scies à métaux |
| hammers (ball-peen, claw, sledge) | marteaux (à panne ronde, à panne fendue, masse) |
| hand saw | scies à main |
| head wrench | clés pour tête d’extincteur |
| hex wrenches (metric and imperial) | clés hexagonales (métriques et impériales) |
| hose wrench | clés à boyaux |
| in-air groovers | rainureuses à l’air libre |
| levels | niveaux |
| line-up bars | barres d’alignement |
| markers | traceurs de contour |
| nipple chuck | retenues filetées |
| oilers | burettes à huile |
| paint brushes | pinceaux |
| pick | pics |
| pipe stand | porte-tuyaux |
| pipe wrench | clés à tuyaux |
| pliers (needle nose, locking, slip joint, side cutting) | pinces (à becs pointus, étaux, à manchon coulissant, coupantes de côté) |
| plumb bob | plombs |
| pry bar (goose neck, wrecking, pinch) | leviers |
| ratchet cutters | coupe-tuyaux à rochet |
| 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 | clés à sangle |
| tripod vice | trépieds |
| trowels (concrete and pointer) | truelles (à béton et à joint) |
| utility knives | couteaux universels |
| vice bench vice | étaux d’établi |
| wire brush | brosses d’acier |
| wire cutter | coupe-fils |

Portable and Stationary Power Tools / Outils mécaniques portatifs

|  |  |
| --- | --- |
| air monitoring device | dispositifs de surveillance de l’air |
| chop saw | scies à tronçonner |
| compressor | compresseurs |
| concrete cutting machine | machines à couper le béton |
| coring machine core driller | carotteuses |
| 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) |
| flushing machine (hydraulic and hydrophneumatic) | appareils à purger |
| fusion welding machine | machines de soudage par fusion |
| grinders (wire brush, angle grinders) | meuleuses (outil à brosser, meuleuses d’angle) |
| groover (hydraulic, cut, press and roll) | rainureuses (hydraulique, par incision, par moletage) |
| hand-held electronic tape | rubans électroniques à main |
| heating torch | chalumeaux de chauffe |
| hole saw | scies emporte-pièce |
| hydraulic bender | cintreuses hydrauliques |
| hydraulic cutter | coupe-tuyaux hydrauliques |
| impact wrenches (electric, pneumatic and wireless) | clés à chocs (électriques, pneumatiques et sans fil) |
| oxy-fuel brazing torch | chalumeaux d’oxybrasage |
| oxy-fuelcutting torch | chalumeaux d’oxycoupage |
| pipe cutter | coupe-tuyaux |
| pipe threaders/groovers | filières à tuyau/rainureuses |
| plasma cutter | découpeuses au plasma |
| powder actuated tools | outils à charge explosive |
| power vice | étaux mécaniques |
| reamer (hand-held or mounted on power threader) | alésoirs (à main ou montés sur filière mécanique) |
| reciprocating saw | scies alternative |
| tamper | pilonneuses |
| tapping machine and attachments | machines à tarauder et accessoires |
| testing pump | pompes d’essai |
| threading machine | fileteuses |
| vacuum cleaner (wet/dry) | aspirateurs pour déchets secs ou humides |
| water pump | pompes à eau |
| wire wheel (body grinder or angle grinder with wire brush) | meuleuses à toile métallique (meuleuse de carrosserie ou d’angle avec outil à brosser) |

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

|  |  |
| --- | --- |
| amp/volt meter | ampèremètres/voltmètres |
| back flow test kit | trousse d’essai anti-retour |
| battery load tester | appareil de vérification de batterie |
| builder’s level | niveaux de bâtisseur |
| calibrating gauge | calibres d’étalonnage |
| calipers | calibres |
| dial indicator | comparateurs à cadran |
| differential pressure gauge | manomètres différentiels |
| diffuser | diffuseurs |
| drafting equipment (scale ruler, compass) | matériel à dessin |
| feeler gauge | jauges d’épaisseur |
| flow meter | débitmètres |
| heat lamp | lampes chauffantes |
| hoses | boyaux |
| hydrometer | hydromètres |
| laser level | niveaux laser |
| laser plumb | fils à plomb laser |
| liquid measuring containers | contenants gradués à liquide |
| magnetic level | niveaux magnétique |
| manometer | manomètres |
| multimeter | multimètres |
| pipe diameter tape | rubans diamétriques |
| Pitot tubes | tubes de Pitot |
| play pipes | tuyaux de lance |
| pressure gauge kit | ensemble de manomètres |
| refractometer | réfractomètres |
| sight tube | tubes d’observation |
| spirit level | niveaux à bulle (torpille, de 2 pieds) |
| square | équerres |
| stop watch | chronomètres |
| straightedge | règles droite |
| tachometer | tachymètres |
| tape measure | rubans à mesurer |
| temperature gauge | thermomètres |
| test hoses and securement | boyaux d’essai et arrimage |
| testing pump, excess, hydrostatic test pump | pompes d’essais, d’excès, d’essais protomatiques |
| thread depth gauge(ring/plug) | calibres de filetage (bague/tampon) |
| torque wrench | clés dynamométrique |
| transit | tachéomètres |
| vernier calliper | pieds à coulisse |

Hoisting, Lifting and Access Equipment / Équipement de hissage, de levage et d’accès

|  |  |
| --- | --- |
| beam clamps | pinces à poutre |
| cable clamps | connecteurs de câble |
| chain block hoist | palans à chaîne |
| chains | chaînes |
| come-alongs (cable or chain) | pince-câbles, palans à levier |
| fork-lift | chariots à fourche |
| grip hoist | treuils manuels |
| jack | crics |
| ladder | échelles |
| overhead hoist | palans aérien |
| pipe buggy (pipe cannon) | chargeuses de tuyaux |
| pipe dolly (grass hopper) | chariots à tubes (sauterelle) |
| portable booms | grues mobiles |
| power-elevated work platform | plateformes de levage (nacelles élévatrice, à ciseaux) |
| rope | cordes |
| scaffolding | échafaudages |
| shackles | manilles |
| sling | élingues |
| snatch blocks | poulies à chape ouvrantes |
| spreader bar | barres d’écartement |
| stand | bases |
| support | supports |
| tugger | chariots tracteur |

Electronic Equipment (General)/ Équipement électronique (général)

|  |  |
| --- | --- |
| digital camera | appareils photo numériques |
| calculator | calculatrices |
| cellular phone | téléphones cellulaires |
| computer | ordinateurs |
| hand-held and stationary radios | appareils radios portatifs et fixes |

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

|  |  |
| --- | --- |
| air hood | hottes |
| air monitoring device | dispositifs de surveillance de la qualité de l’air |
| apron | tabliers |
| boots | bottes |
| confined space entry equipment | équipement d’entrée d’espace clos |
| coveralls | combinaisons de travail |
| earplugs and earmuffs | bouchons d’oreille et cache-oreilles antibruit |
| eye wash stations | douches oculaires |
| face shield | masques faciaux |
| fall protection equipment | équipement de protection contre les chutes |
| fire blanket | couvertures antifeu |
| fire extinguisher | extincteurs |
| fire hoses | boyaux d’incendie |
| fire-retardant clothing | tenues de feu ignifuges |
| first aid kit | trousse de premiers soins |
| gloves | gants |
| goggles | lunettes de protection |
| hard hat | casques protecteurs |
| high voltage rubber insulating blankets and gloves | couvertures et gants en caoutchouc isolant de haute tension |
| knee pads | genouillères |
| reflector vest | vestes réfléchissantes |
| respirators (particle, vapour) | respirateurs (particules, vapeur) |
| safety glasses | lunettes de sécurité |
| self-contained breathing apparatus (SCBA) | appareil respiratoire autonome (ARA) |
| spill kit | équipement de lutte contre les déversements |
| tag- and lock-out devices | dispositifs de cadenassage et d’identification |
| welding partition screen | écrans de soudage |

APPENDIX C

GLOSSARY

|  |  |  |  |
| --- | --- | --- | --- |
| **accelerators** | quick opening device that speeds up the trip action of a dry pipe valve | **accélérateurs** | dispositifs d’ouverture rapide qui accélère le déclenchement des clapets d’alarme sous air |
| **air dryer** | any one of several types of air dryers, such as refrigerated air dryers and desiccant air dryers | **déshydrateurs** | systèmes utilisés pour enlever la vapeur d’eau de l’air comprimé dans les systèmes à préaction et les systèmes pilotes secs |
| **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 enterrées |
| **cathodic protection** | a method of grounding used primarily on steel water tanks and underground piping to prevent electrolysis | **protections cathodiques** | méthodes utilisées pour empêcher la corrosion causée par l’électrolyse sur la tuyauterie et les réservoirs souterrains |
| **combined dry pipe/preaction system** | dry pipe system that employs a supplemental detection system | **systèmes mixtes à préaction et sous air** | systèmes de gicleurs sous air qui utilisent un système de détection supplémentaire |
| **cross-connection control** | assemblies that prevent potentially contaminated water from flowing back into the water supply | **dispositifs de prévention du raccordement croisé** | utilisation de dispositifs antirefoulement pour empêcher l’eau possiblement polluée de retourner dans le réseau d’alimentation en eau potable |
| **deluge system** | a system with open sprinkler heads, set up so that when the system is tripped all heads spray simultaneously | **systèmes de gicleurs déluge** | réseaux sous air 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 in rod or pipe | **filières** | outils servant à faire des filetages externes sur des tiges ou des tuyaux |
| **dry pipe system** | a sprinkler system charged with air, primarily used to prevent freezing in a cold environment | **réseaux sous air** | systèmes de protection‑incendie généralement à air comprimé ou à l’azote utilisés là où il y a des conditions de gel |
| **escutcheon (plate)** | aesthetic or cosmetic plates through which sprinkler heads enter the building space (sometimes called escutcheon plates) | **rosaces** | plaques ou autres dispositifs servant à couvrir l’espace annulaire autour d’un gicleur afin de conserver le positionnement du gicleur au centre du point d’introduction |
| **excess pressure pump** | water pump that boosts pressure to prevent false alarms | **pompes de surpression** | pompes à eau automatique qui maintiennent la pression du système sous eau plus élevée que la plus haute pression d’alimentation prévue pour empêcher les fausses alarmes |
| **fire pump assembly** | water pump designed to supply or supplement flow and pressure dedicated to fire protection | **pompes d’incendies** | pompes à eau conçues pour offrir ou augmenter le débit et la pression consacrée à la protection contre les incendies |
| **flow switch** | a device that monitors water flow and initiates an alarm signal to a fire alarm panel or equivalent | **régulateurs de débit** | dispositifs qui déclenchent une alarme de débit d’eau en cas de conditions irrégulières du débit de l’eau |
| **flushing connection** | a connection used to flush water from piping and components; for example, at the end of a water main or hydrant | **raccords de purge** | raccords permettant de purger les débris d’une canalisation |
| **grade** | the slope of a pipe or trench, usually expressed as a ratio of rise (change in elevation) to run (change in distance) | **pente** | la pente d’un tuyau ou d’une tranchée, généralement exprimée comme le rapport entre l’inclinaison (changement dans l’élévation) et la course (changement dans la distance) |
| **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 par lequel la circonférence extérieure d’un tuyau est rainurée par enlèvement de métal, par pression ou par moletage |
| **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 et aux composants des tuyaux |
| **heat-actuated detectors (HAD)** | heat-activated device, triggered when a specified temperature or rate of increasing temperature is detected | **appareils aérothermiques** | dispositifs qui se déclenchent à une température donnée ou à une élévation de température donnée |
| **laydown** | a pre-determined area where material is stored | **pièces de rangement** | endroits prédéterminé où le matériel est rangé |
| **mark-ups / as-built drawing** | a revised set of drawings submitted by a contractor upon completion of a project that reflect all changes made in the specifications and shop drawings during the construction process | **dessins d’après-exécution/conformes à l’exécution** | ensemble de dessins révisés soumis par le contracteur suite à la complétion d’un projet, et qui inclus les changements spécifiés et les dessins d’atelier effectués pendant la construction |
| **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** | systèmes qui utilisent des gicleurs automatiques reliés aux réseaux de tuyaux contenant de l’air pouvant être comprimé, et comportant un système additionnel de détection aux mêmes endroits que les gicleurs |
| **pressure switch** | a device used for monitoring high or low pressure in piping system | **interrupteurs de pression** | dispositifs utilisés 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 or flare 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 ou l’évasement résultant de la coupe du tuyau |
| **seismic/sway bracing** | pipe restraint system | **contreventements parasismiques ou obliques** | systèmes de retenue qui empêchent le mouvement différentiel entre les tuyaux et le bâtiment en cas de tremblement de terre |
| **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** | dessins 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 | **manchons** | dispositifs qui donnent un libre accès à un point d’introduction du bâtiment |
| **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 | **élingues** | éléments souples en métal ou en matière synthétique servant à soutenir une charge dans le but de la lever ou de la déplacer |
| **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 hoses may be attached | **réseaux de canalisation d’incendie** | réseaux de tuyaux soit verticaux ou horizontaux qui fournissent une alimentation en eau afin d’aider à combattre les incendies manuellement |
| **suppression systems** | types include wet/dry chemical, gas, clean agent, mist, hybrid | **systèmes d’extinction** | systèmes qui entraînent une rapide réduction du débit calorifique d’un feu, prévenant sa reprise par moyens directs et une application adéquate de médias de protection‑incendie sur la surface en feu |
| **tamper switch** | device which monitors the opening or closing of a valve by sounding a signal in fire alarm panel | **interrupteurs de sécurité** | dispositifs 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 | **massifs de butée** | dispositifs de retenue en béton coulé sur place à l’endroit critique d’une canalisation enterrée 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” | **garnitures** | tuyauterie et composants fixés aux soupapes, aux réservoirs et aux pompes afin de favoriser un fonctionnement adéquat |
| **valves** | device placed in a pressurized piping system in order to control, direct or prevent the movement of chemicals, gases, liquids or other substances | **soupapes** | dispositifs placés dans les réseaux de tuyauterie afin de réguler ou diriger le mouvement des fluides |
| **water motor gong** | a water-operated local audible alarm | **cloches hydrauliques** | alarmes sonores locales actionnées par l’eau |
| **wet pipe system** | sprinkler system charged with water | **réseaux d’extinction automatique à eau** | systèmes de protection‑incendie qui utilisent des gicleurs automatiques rattachés à un réseau de tuyauterie contenant de l’eau et connectés à un tuyau d’alimentation en eau de sorte que l’eau coule immédiatement des gicleurs en cas de chaleur ou d’un incendie |