Sprinkler System Installers

NOC 7252

Introduction

Sprinkler System Installers fabricate, install, test, maintain and repair water, foam, carbon dioxide and dry chemical sprinkler systems in buildings for fire protection purposes. Sprinkler System Installers are employed by sprinkler system contractors, or they may be self-employed.

The most important Essential Skills for Sprinkler System Installers are:

- Numeracy
- Oral Communication
- Problem Solving

Document Sections

- Reading Text
- Document Use
- Writing
- Numeracy
- Oral Communication
- Thinking Skills
    - Problem Solving
    - Decision Making
    - Critical Thinking
    - Job Task Planning and Organizing
    - Significant Use of Memory
    - Finding Information
- Working with Others
- Computer Use
- Continuous Learning
- Notes

A. Reading Text

Reading Text

Tasks	Complexity Level	Examples
Typical	1 to 3	Sprinkler System Installers: • read notes and instructions on work orders, outlining projects to be completed. (1) • read bulletins about health and safety issues. (2) • read installation instructions and product data sheets for information about products used on the job. For example, they scan the installation instructions for a new type of sprinkler head. (2) • read warnings and instructions on signs and placards within buildings and make decisions on what special precautions, tools and materials may be needed. (2) • read and interpret Inspector's forms, Fire Department reports and written recommendations for correcting system problems or deficiencies. (2)
Most Complex	4	• read Original Equipment Manufacturers' (OEM) manuals for technical information on installation, troubleshooting, disassembly, re-assembly and maintenance of equipment and components. This includes reading paragraphs of text which help the fitter to interpret diagrams, charts and graphs. (3) • read training materials for courses such as Confined Space Entry (CSE), Transportation of Dangerous Goods (TDG) and the Workplace Hazardous Materials Information System (WHMIS). (3) • read the National Fire Protection Association (NFPA) code book. This code is a multi-volume set that is complex and lengthy. Some interpretation is needed to apply the code to practical work. Information from one section may be superseded by information in other sections. Text is supplemented and illustrated with tables, schedules, diagrams, charts and graphs. (4)

Reading Summary

The symbol √ is explained in the Use of Symbols section.

	Purpose for Reading			
Type of Text	**To scan for specific information/To locate information**	**To skim for overall meaning, to get the 'gist'**	**To read the full text to understand or to learn**	**To read the full text to critique or to evaluate**
Forms	√	√		
Labels	√			
Notes, Letters, Memos	√	√	√	
Manuals, Specifications, Regulations	√	√	√	
Reports, Books, Journals				

B. Document Use

Document Use

Tasks	Complexity Level	Examples
Typical	1 to 3	Sprinkler System Installers: • use telephone books and internal telephone directories. (1) • prepare lists of tools and materials. (1) • complete daily time sheets, expense accounts, inspection reports, non-conformity tags, job evaluation sheets, and sprinkler system inspection checklists by marking check boxes, recording numerical information or entering words, phrases and sentences. (2) • look for information on manufacturers' product specification sheets. Scan product descriptions for information such as head sizes, spray angles and operating temperatures. (2) • create sketches to illustrate pipe layouts; draw changes directly onto construction plans. (2) • scan lists of materials/parts included with construction plans. Locate part descriptions and part numbers on invoices, plans and packing slips. (2) • complete expense account records. (2) • use maps to plan routes to remote job locations. (2)
Most Complex	3	• complete incident/accident report forms. (2) • compare packing slips with order forms to verify proper quantities of materials were received, and note any items on backorder. (2) • scan workplace labels, WHMIS symbols and Material Safety Data Sheets to determine if Personal Protective Equipment is required or to determine if the product can be used in a specific, hazardous environment. (3) • refer to schematics to understand and test system flows during inspections, and to understand supervisory control or alarm system functions and operation. (3) • refer to technical manuals to get information needed to order replacement parts. (3) • refer to scale drawings for information on system layouts/elevations, physical dimensions of structures and equipment specifications in order to plan new installations or make repairs to existing systems and equipment. (3)

Document Use Summary

- Read signs, labels or lists.
- Complete forms by marking check boxes, recording numerical information or entering words, phrases, sentences or text of a paragraph or more. The list of specific tasks varies depending on what was reported.
- Read completed forms containing check boxes, numerical entries, phrases, addresses, sentences or text of a paragraph or more. The list of specific tasks varies depending on what was reported.
- Read tables, schedules or other table-like text (e.g., read work shift schedules).
- Obtain specific information from graphs or charts.
- Interpret information on graphs or charts.
- Recognize common angles such as 15, 30, 45 and 90 degrees.
- Draw, sketch or form common shapes such as circles, triangles, spheres, rectangles, squares, etc.
- Interpret scale drawings (e.g. blueprints or maps).
- Take measurements from scale drawings.
- Read assembly drawings (e.g. those found in service and parts manuals).
- Read schematic drawings (e.g. electrical schematics).
- Make sketches.
- Obtain information from sketches, pictures or icons (e.g., computer toolbars).

C. Writing

Writing

Tasks	Complexity Level	Examples
Typical	1 to 3	Sprinkler System Installers: • write brief safety meeting reports consisting of single sentences. (1) • write notes consisting of single sentences and phrases on inspection checklists, describing deficiencies and corrective action taken. (1) • use pocket notebooks for recording general notes regarding daily activities, and detailed notes pertaining to planning and scheduling. (1) • make notes on construction plans to indicate changes or material substitutions. (1) • may write a short memo to the site engineer or the architect about installation requirements, changes to the original plans, or installation problems. (2) • write a paragraph or more of text on inspection reports and job evaluation sheets. (2) • prepare progress reports for their supervisors or managers describing the status of their assigned projects, explaining such things as cost overruns, and analysing scheduling problems. (3) • complete incident/accident investigation reports, writing sections of one or more paragraphs of text describing incident causal factors and detailing corrective measures to be implemented to prevent future incidents. (3)
Most Complex	3	

Writing Summary

The symbol √ is explained in the Use of Symbols section.

	Purpose for Writing						
Length	**To organize/ to remember**	**To keep a record/to document**	**To inform/ to request information**	**To persuade/ to justify a request**	**To present an analysis or comparison**	**To present an evaluation or critique**	**To entertain**
Text requiring less than one paragraph of new text	√	√	√				
Text rarely requiring more than one paragraph		√	√	√			
Longer text			√	√	√		

D. Numeracy

The symbol √ is explained in the Use of Symbols section.

Numeracy

Tasks	Complexity Level	Examples
√ Money Math	1 to 2	Sprinkler System Installers: • purchase materials and services using cash or company purchase orders. (Money Math), (1)
√ Scheduling, Budgeting & Accounting Math	2 to 3	• total receipts and invoices for expense claims. This includes calculating mileage and meal reimbursements at the rate specified in the Collective Agreement. (Money Math), (2) • schedule daily and weekly work tasks for a small crew of two to five individuals. (Scheduling, Budgeting & Accounting Math), (2)
√ Measurement and Calculation Math	1 to 4	• schedule the sequence of events needed to complete retro-fitting and repair tasks in occupied buildings. Arrange shut-downs with building managers, insurance company representatives and Fire Department officials; plan for deliveries; rent auxiliary equipment; etc. (Scheduling, Budgeting & Accounting Math), (3)
√ Data Analysis Math	1 to 3	• use an anti-freeze tester to determine the low ambient rating of liquid in the system. (Measurement and Calculation Math), (1)
√ Numerical Estimation	1 to 3	• determine the best location for a sprinkler head with a fixed spray angle by measuring the distance from floor to ceiling and the distance from wall to centreline of piping to ensure proper coverage. (Measurement and Calculation Math), (2) • convert length measurements from SI to imperial and vice versa for various types of applications. For example, some pipe and fittings are supplied with both SI and Imperial measurements and scale drawings can be prepared in either Imperial or SI measurements depending on their origin. (Measurement and Calculation Math), (2) • calculate offsets and rolling offsets when installing 45º and 90º fittings in piping systems. (Measurement and Calculation Math), (3)

		• use geometry to determine if a sprinkler head has sufficient coverage when obstructions such as a bulkhead protrude into the coverage area. For example, the coverage of the spray pattern is determined using the spray angle of the sprinkler head and the dimensions of the particular area being protected. Depending on the spray coverage criteria, an additional sprinkler head may have to be installed. (Measurement and Calculation Math), (3) • calculate the volume of liquid needed to charge a sprinkler system. For example, to determine total liquid capacity of the piping system, Sprinkler System Installers calculate the volume of each section of pipe according to its diameter and length, then add the volumes together and convert the result to gallons. The task is complicated by the many parts to the calculation, the unique features of each system and the stringent NFPA code requirement for accuracy. (Measurement and Calculation Math), (4) • compare piping system pressures taken several hours apart to determine if it leaks. (Data Analysis Math), (1) • when testing new systems or investigating obstructions in old ones, take and analyze several pressure and flow measurements to ensure that the system achieves 'design' flow rates and sprinkler head pressures. (Data Analysis Math), (3) • estimate travel time between work sites based on the known distance in miles or kilometres. (Numerical Estimation), (1) • estimate linear dimensions, volumes, pressures, angles, temperatures and voltages. (Numerical Estimation), (1) • may occasionally provide on-the-spot estimates of additional cost when forced to modify construction plans. The cost of the alteration may be one of several factors considered when making alternate plans. (Numerical Estimation), (2) • estimate time by considering the work to be completed, the number of available or required crew members, the time to acquire materials and to deal with workplace congestion and travel time to the work site. (Numerical Estimation), (3)

Math Skills Summary

a. Mathematical Foundations Used

The symbol √ is explained in the Use of Symbols section.

Mathematical Foundations Used

Code	Tasks	Examples
	Number Concepts	
√	Whole Numbers	Read and write, count, round off, add or subtract, multiply or divide whole numbers. For example, estimating the square footage of a room to determine the required number of sprinklers per square foot.
√	Integers	Read and write, add or subtract, multiply or divide integers. For example, mixing of anti-freeze with water to achieve the appropriate negative temperature rating for cold environment applications.
√	Rational Numbers - Fractions	Read and write, add or subtract fractions, multiply or divide by a fraction, multiply or divide fractions. For example, measuring in fractions of an inch from ceiling to centreline of the pipe to maintain the proper grade (fall) on a pipe so the system drains properly.
√	Rational Numbers - Decimals	Read and write, round off, add or subtract decimals, multiply or divide by a decimal, multiply or divide decimals. For example, adding and subtracting lengths of pipe in metres to one or two decimal places.
√	Rational Numbers - Percent	Read and write percents, calculate the percent one number is of another, calculate a percent of a number. For example, calculating the quantity of polypropylene glycol required based on the total water volume of the system, to ensure 60% anti-freeze to 40% water.
√	Equivalent Rational Numbers	Convert between fractions and decimals or percentages. For example, converting fractions to decimals for easy calculation.
√	Other Real Numbers	Use powers and roots, scientific notation, significant digits. For example, using hydraulic formulae with values expressed as powers and roots.

Code	Tasks	Examples
		Patterns and Relations
√	Equations and Formulae	Use formulae by inserting quantities for variables and solving. For example, calculating the circumference of a pipe as (pi x Diameter); or the volume of a pipe as (f à x Radius2 x Length).
√	Use of Rate, Ratio and Proportion	Use a ratio showing comparison between two quantities with the same units. Use a proportion showing comparison between two ratios or rates in order to solve problems. For example, preparing a mixture of 6 parts polypropylene-glycol to 4 parts water for cold area sprinkler systems, or calculating the quantity of polypropylene-glycol required in a system that contains a total liquid volume of 1328 gallons at a ratio of 6:4 glycol to water. Using scale drawings.
		Shape and Spatial Sense
√	Measurement Conversions	Perform measurement conversions. For example, converting from inches to centimetres when interpreting measurements on drawings. Approximate SI conversions are common, for example, converting Imperial gallons to litres when mixing liquids, converting feet to metres on older scale drawings, or converting millimetres to inches for pipe diameters.
√	Areas, Perimeters, Volumes	Calculate areas. Calculate perimeters. Calculate volumes. For example, calculating the square footage of a building to determine sprinkler heads needed; calculating the lengths of pipe required for sprinkler installations that follow the perimeter of a room; calculating piping system volume; calculating the output volume and pressure of a system at the top floor of a building by de-rating the pump capacity using a pre-determined rating factor for each vertical foot of lift.
√	Geometry	Use geometry. For example, using a protractor to measure an off-set angle on a pipe or fitting. Recognizing common angles. Drawing, sketching and forming common forms and figures.

Code	Tasks	Examples
		Statistics and Probability
√	Statistics and Probability	Use descriptive statistics (e.g. collecting, classifying, analyzing and interpreting data). Use inferential statistics (e.g. using mathematical theories of probability, making conclusions about a population or about how likely it is that some event will happen). For example, using measured values at several points in the system to analyze system operation when flow testing. Using tables, schedules or other table-like text. Using graphical presentations.

b. How Calculations are Performed

- In their heads.
- Using a pen and paper.
- Using a calculator.
- Using a computer.

c. Measurement Instruments Used

- Time. For example, using calendars, clocks, wrist watches, and stop watches.
- Weight or mass. For example, using fixed weigh scales or small portable scales.
- Distance or dimension. For example, using tape measures, squares, vehicle odometers.
- Liquid volume. For example, using measuring jugs, pails, barrels, and flow meters.
- Temperature. For example, using conventional and digital thermometers.
- Pressure. For example, using pressure gauges and equipment gauges.
- Angles. For example, using protractors.
- RPM. For example, using a tachometer.
- Use the SI (metric) measurement system.
- Using the imperial measurement system.

E. Oral Communication

Oral Communication

Tasks	Complexity Level	Examples
Typical	1 to 2	Sprinkler System Installers: • assign job tasks to apprentices and other crew members. (1) • lead tailgate safety meetings with crew members and participate in weekly job site safety meetings with other trades people. (2) • interact with suppliers or manufacturers to get detailed product information on components such as valves and sprinkler heads and to order materials, equipment and services. (2) • interact with building managers, building inspectors, insurance company representatives and Fire Department officials to answer questions and discuss details of system installation plans and regulatory or code issues. (2) • discuss details of work plans and safety hazards with staff, supervisors and co-workers. Meet with members of the crew to co-ordinate activity and solve problems. (2)
Most Complex	3	• communicate with electricians, carpenters and mechanical contractors to resolve equipment installation conflicts that arise from drawing errors or omissions. (2) • negotiate with co-workers over task assignment issues and resolve conflicts. Negotiate with other trades to gain workplace efficiencies such as sharing access to lifts, floor area and loading docks. (2) • explain test procedures and the theory behind them to apprentices when testing or installing sprinkler systems. Clear communication of practice and theory is an important part of apprenticeship training and often a necessity for safe working conditions. (3) • communicate with angry building managers or owners when property damage is caused by vandalism or false alarms that cause the sprinkler system to discharge unnecessarily. (3)

Modes of Communication Used

- In person.
- Using a telephone.
- Using a two-way radio or other such means.
- Using specialized communications signals. For example, they use standardized hand signals to instruct a crane operator when hoisting heavy materials and equipment.

Environmental Factors Affecting Communication

On the job, the ability to see and hear can be impaired by tool and equipment noise, elevated or confined work areas, protective clothing, wind, and inclement weather.

Oral Communication Summary

The symbol √ is explained in the Use of Symbols section.

	Purpose for Oral Communication (Part I)					
Type	**To greet**	**To take messages**	**To provide /receive information, explanation, direction**	**To seek, obtain information**	**To co-ordinate work with that of others**	**To reassure, comfort**
Listening (little or no interaction)						
Speaking (little or no interaction)						
Interact with co-workers			√	√	√	
Interact with those you supervise or direct			√	√	√	
Interact with supervisor/ manager			√	√	√	
Interact with peers and colleagues from other organization						
Interact with customers/ clients/ public			√	√	√	√
Interact with suppliers, servicers			√	√	√	
Participate in group discussion			√	√	√	
Present information to a small group						
Present information to a large group						

The symbol √ is explained in the Use of Symbols section.

	Purpose for Oral Communication (Part II)					
Type	**To discuss (exchange information, opinions)**	**To persuade**	**To facilitate, animate**	**To instruct, instill understanding, knowledge**	**To negotiate, resolve conflict**	**To entertain**
Listening (little or no interaction)						
Speaking (little or no interaction)						
Interact with co-workers	√	√		√	√	
Interact with those you supervise or direct	√	√		√	√	
Interact with supervisor/ manager	√	√			√	
Interact with peers and colleagues from other organization						
Interact with customers/ clients/ public						
Interact with suppliers, servicers						
Participate in group discussion			√			
Present information to a small group	√					
Present information to a large group						

F. Thinking Skills

1. Problem Solving

Problem Solving

Tasks	Complexity Level	Examples
Typical	2 to 3	Sprinkler System Installers: • may deal with problems regarding insufficient or incorrect types of piping, valves, couplings or sprinkler heads shipped to site. They must determine what is required, make arrangements to have the correct materials provided, and then reorganize job tasks to minimize lost time. (2) • may deal with competition from other trades for working space, scaffolding or access to certain areas of the building. They have to plan carefully and communicate their requirements effectively and with tact. (2)
Most Complex	3	• may face difficult problems with disassembly and reassembly of heavy equipment. They must plan in advance and use hoisting aids and clamps to maintain the desired position of the equipment. (2) • may deal with unexpected physical obstructions or interference from other mechanical systems. This may result in the inability to install the sprinkler system as specified in the plans. The installer must re-route the piping or redesign one section. All changes must be noted and sketched onto the plan. The changes to the plan must comply with the National Fire Protection Association (NFPA) code. (3) • may face owners or building managers who are difficult or hostile. They have to ask questions and provide information to help the person understand the situation and avoid continued hostility and conflict. (3)

2. Decision Making

Decision Making

Tasks	Complexity Level	Examples
Typical	1 to 2	Sprinkler System Installers: • decide if they require assistance from a co-worker or whether to use mechanical assistance to move heavy materials. (1) • decide on the assignment of tasks to various crew members based on their individual skill level, qualifications, experience and suitability for the work. (2)
Most Complex	2	• decide whether to repair or replace equipment components, and what work tasks take priority over other tasks based on their experience and knowledge of the systems and the urgency to return the system to operation. (2) • decide on the time and location to start work on a new project. If they start too early, time is wasted waiting for other trades to complete their work; too late and the job will be made more difficult because the fitter may have to work around finished construction. (2)

3. Critical Thinking

Critical Thinking information was not collected for this profile.

4. Job Task Planning and Organizing

Job Task Planning and Organizing

Complexity Level	Description
3	Own job planning and organizing • Sprinkler System Installers may work alone, with a partner or with a small crew. In all cases, they need to plan each day's activities and organize the tools and materials needed to carry out job tasks. They must co-ordinate their work tasks with building managers, fire department officials, insurance company representatives and other trades to avoid interference with installation of the equipment and congestion of people in the work area. Job task planning has to be flexible to account for interruptions due to lack of access to the work site or needed equipment. Occasionally, work on one job has to be abandoned temporarily in favour of another job where work can be carried out more productively. Consideration must always be given to the operational requirements of the building and urgency of the work.

5. Significant Use of Memory

Examples

- remember the names of other trades people, building managers and fire department officials.
- remember security codes and padlock numbers for many different locations.
- remember static and residual pressure data when testing systems.
- remember field measurements until they can be written down or used.

6. Finding Information

Finding Information

Tasks	Complexity Level	Examples
Typical	1 to 3	Sprinkler System Installers: • contact suppliers and manufacturers to get information and technical data on equipment. (1) • refer to manuals, catalogues, parts books and use the Internet to get information and technical data needed to order parts and materials. (2) • refer to WHMIS labels, hazard symbols, Material Safety Data Sheets (MSDS), Transportation of Dangerous Goods (TDG), Occupational Health and Safety (OH&S) regulations, and general health and safety manuals to locate information on products they are using. (2) • talk to co-workers to get opinions and suggestions on repair and maintenance problems. (2) • refer to the National Fire Protection Association (NFPA) code for regulations on system installation and repairs. (3)

G. Working with Others

Participation in Supervisory or Leadership Activities

- Participate in formal discussions about work processes or product improvement.
- Have opportunities to make suggestions on improving work processes.
- Monitor the work performance of others.
- Inform other workers or demonstrate to them how tasks are performed.
- Orient new employees.
- Assign routine tasks to other workers.
- Assign new or unusual tasks to other workers.
- Identify training that is required by, or would be useful for, other workers.

H. Computer Use

Computer Use

Tasks	Complexity Level	Examples
Typical	2	Sprinkler System Installers: • they may prepare a brief report to the supervisor or manager describing work progress on a project. (1) • they enter data into maintenance logs. (1) • they may use the Internet to locate and download technical information on new products and read trade-related information. (2) • use computer-controlled equipment. For example, they troubleshoot and test alarm/control systems regularly, and disarm and isolate zones where work is being performed. (2)

Computer Use Summary

- Use word processing.
- Use a spreadsheet.
- Use communications software.
- Other

I. Continuous Learning

How Learning Occurs

Learning may be acquired:

- As part of regular work activity.
- From co-workers.
- Through training offered in the workplace.
- Through reading or other forms of self-study
    - at work.
    - using materials available through work.
- Through off-site training
    - partially subsidized.

J. Other Information

In addition to collecting information for this Essential Skills Profile, our interviews with job incumbents also asked about the following topics.

Attitudes
Sprinkler System Installers interviewed felt that people in this occupation should have a good work ethic and be self-confident, self-motivated, respectful, honest, co-operative and dependable. They felt that people should have a positive attitude toward their work and other people, be able to maintain composure during stressful situations, and be able to communicate their thoughts effectively to others to promote good working relations.

Future Trends Affecting Essential Skills
The introduction of new technology is expected to continue to drive the need for further trade skills. For example, some companies are introducing Palm-Pilots so workers can carry out inspections more quickly. Employers see the need for employees to develop improved essential skills such as writing, daily planning, and oral communication.

K. Notes

This profile is based on interviews with job incumbents across Canada and validated through consultation with industry experts across the country.
For information on research, definitions, and scaling processes of Essential Skills Profiles, please consult the Readers' Guide to Essential Skills Profiles (http://www.hrsdc.gc.ca/eng/jobs/les/profiles/readersguide.shtml).