Skilled Trades Ontario | Métiers spécialisés Ontario

Apprenticeship Curriculum Standard

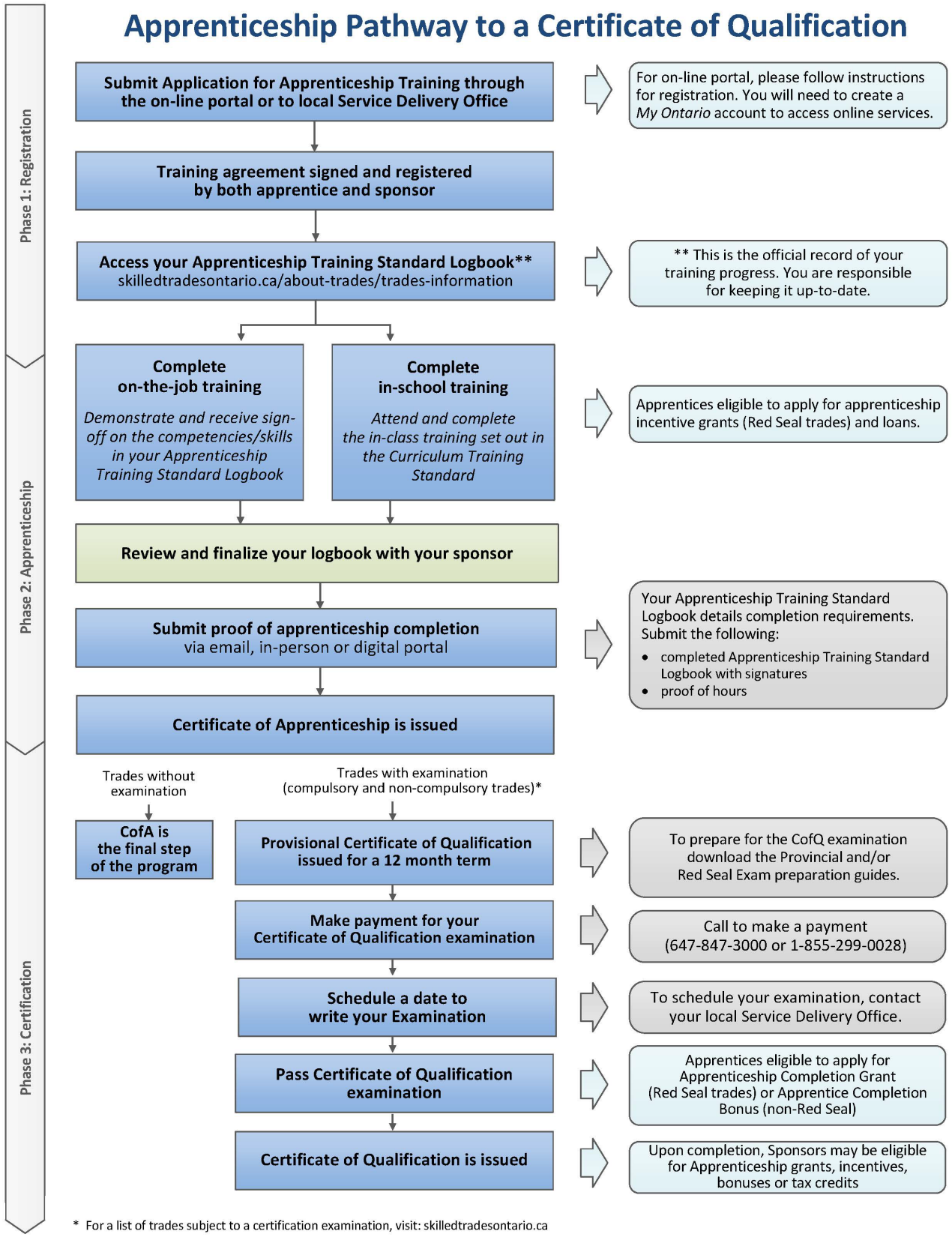
Sprinkler and Fire Protection Installer

Level 1, 2 and 3

427A

2007

Apprenticeship Pathway to a Certificate of Qualification



* For a list of trades subject to a certification examination, visit: skilledtradesontario.ca

Draft version: 2022-03-16

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Please Note: This Standard has been revised to reflect the visual identity of Skilled Trades Ontario (STO) which replaced the Ontario College of Trades on January 1, 2022. The content of this Standard may refer to the former organization; however, all trade specific information or content remains relevant and accurate based on the original date of publishing.

Please refer to STO's website: **skilledtradesontario.ca** for the most accurate and up to date information. For information about BOSTA and its regulations, please visit ***Building Opportunities in the Skilled Trades Act, 2021* (BOSTA).**

Any updates to this publication are available on-line; to download this document in PDF format, please follow the link: Skilled Trades Ontario.ca.

Maintained with transfer to Skilled Trades Ontario 2007 (V100)

Preface

This curriculum standard for the Sprinkler & Fire Protection Installer trade program is based upon the on-the-job performance objectives, located in the industry-approved training standard.

The curriculum is organized into three levels of training. The Reportable Subjects Summary chart (located on page 3) summarizes the training hours for each reportable subject.

The curriculum identifies the learning that takes place in-school. The in-school program focuses primarily on the theoretical knowledge and the essential skills required to support the performance objectives of the Apprenticeship Training Standards.

Employers/Sponsors are expected to extend the apprentice's knowledge and skills through practical training on a work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to verify that all apprentices have achieved the learning outcomes identified in the curriculum standard.

It is not the intent of the in-school curriculum to perfect on-the-job skills. The practical portion of the in-school program is used to reinforce theoretical knowledge. Skill training is provided on the job.

Please refer to Skilled Trades Ontario website (www.skilledtradesontario.ca) for the most accurate and up-to-date information about Skilled Trades Ontario. For information on *Building Opportunities in the Skilled Trades Act, 2021 (BOSTA)*) and its regulations, please visit Building Opportunities in the Skilled Trades Act, 2021, S.O. 2021, c. 28 - Bill 288 (ontario.ca)

Pre-requisites
In order to advance to Level 2 of the apprenticeship program, an individual must have completed all of the units outlined in Level 1. Similarly, in order to advance to Level 3 of the program, an individual must have completed all of the units outlined in Level 1 and 2.

Hours Disclaimer (if applicable)
It is agreed that Training Delivery Agents (TDAs) may need to make slight adjustments (with cause) according to particular apprentice needs and may deviate from the unit sequencing and the prescribed practical and theoretical hours shown within the standard. However, all TDAs will comply with the hours at the reportable subject level.

Suggested Equipment for Training Delivery Agencies
Personal and Safety Equipment: Personal protective equipment is at the discretion of the TDA who must conform to Ontario Provincial Health and Safety Regulations.

Please note that all practices described in this standard must be performed according to the appropriate Trade and Industry best practice.

Level 1

Reportable Subject Summary – Level 1

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
S0421	Protect Self and Others	30	28.5	1.5
S0422	Tools and Equipment	9	4	5
S0423	Fabrication of Pipe and Fittings	81	53	28
S0424	Fire Protection Systems & Devices	120	120	0
	Total Hours	**240**	**205.5**	**34.5**

Reportable Subject Summary – Level 2

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
S0425	Rigging, Framing and Hoisting	12	9	3
S0426	Installation of Water Supply	75	75	0
S0427	Standpipe Fire Protection System	24	24	0
S0428	Specific Application Sprinkler Heads	30	30	0
S0429	Inspection, Testing and Maintenance of Fire Protection Systems	63	35.5	27.5
S0430	Installation of Piping Offsets	36	36	0
	Total Hours	**240**	**209.5**	**30.5**

Reportable Subject Summary – Level 3

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
S0431	Design Systems	48	36	12
S0432	Installation of Pumps, Drivers and Controllers	72	72	0
S0433	Detection and Actuation Devices	48	33	15
S0434	Specific Application Fire Protection Systems	42	42	0
S0435	Communication and Documentation	30	15	15
	Total Hours	**240**	**198**	**42**

Number:	S0421
Title:	**Protect Self and Others**
Duration:	30 Total Hours Theory: 28.5 Hours Practical: 1.5 Hours
Prerequisites:	None
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Codes, Acts and Regulations	6	6	0
2	Personal Protective Equipment	3	1.5	1.5
3	Housekeeping Duties	1.5	1.5	0
4	Fire Safety Procedures	1.5	1.5	0
5	Hazardous/Toxic Materials	6	6	0
6	Audio-Visual Alarms	1.5	1.5	0
7	Working Within Safe Physical Limits	1.5	1.5	0
8	Working Within Confined Space	3	3	0
9	Worksite Conditions	3	3	0
10	Lock Out and Tag Equipment	3	3	0
	Total Hours	**30**	**28.5**	**1.5**

Number:	1
Title:	**Codes, Acts and Regulations**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.01	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate the use of safe working habits and procedures according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify applicable acts, codes and regulations.
- Occupational Health and Safety Act and Regulations (OHSA)
- Trades Qualification and Apprenticeship Act (TQAA)and Regulations
- Workplace Safety Insurance Act (WSIA)
- Environmental Protection Act (EPA)
- Boilers and Pressure Vessels Act (BPVA)
- Dangerous Goods Transportation Act (DGTA)
- Building Code Act (BCA)
- Workplace Hazardous Materials Information System (WHMIS)
- Ontario Fire Code (OFC)
- Building Codes
- National Fire Prevention Association (NFPA)

1.2 Explain the difference between the “Act” and the “Regulations.”

1.3 Identify the sections of OHSA that deal with the construction industry.

1.4 Interpret applicable acts, codes and regulations.
- identify the group responsible for enforcement of the construction health and safety outlined in OHSA
- state the responsibilities of the employer, worker and inspector
- explain when a worker may refuse work
- define a supervisor and a competent worker
- explain when a safety supervisor and/or a safety committee must be established

1.5 Identify and apply sections of applicable acts, codes and regulations related to:

- personal protective clothing
- hand and power tools
- fire safety procedures
- hazardous/toxic materials
- fire safety procedures
- first aid treatment, including CPR
- flammable substances
- housekeeping practices

1.6 Explain common causes of most construction accidents.

Number:	2
Title:	**Personal Protective Equipment**
Duration:	3 Total Hours Theory: 1.5 Hours Practical: 1.5 Hours
Cross-Reference to Training Standard: 5440.02	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate the ability to protect self and others through the use of appropriate work dress and personal protective equipment, according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify and interpret sections of the Ontario Occupational Health and Safety Act, Construction Safety Association of Ontario, and company policies and procedures related to personal protection.

2.2 Describe the requirements for acceptable work dress and personal protective equipment including:
- safety boots
- hard hats
- gloves
- glasses, goggles
- masks
- coveralls
- safety harness
- respirators
- ear protection
- barrier creams

2.3 Select, adjust and maintain protective equipment that provides maximum protection suitable to the given task including:
- work clothing
- headwear
- foot wear
- eye wears

Number:	3
Title:	**Housekeeping Duties**
Duration:	1.5 Total Hours Theory: 1.5 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.03	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate the ability to maintain a clean and safe work area according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Identify and comply with all applicable codes, and company/customer standards.

3.2 Identify the location of first aid equipment and supplies.

3.3 Identify the location of fire extinguishers.

3.4 Identify job conditions that require heating, ventilation and lighting.

3.5 Explain the purpose of storing material and equipment in designated areas.

3.6 Erect protective barriers as required.

3.7 Remove debris to designated locations at intervals that will keep the work area clean and safe.

3.8 Recycle materials as required and where possible.

Number:	4
Title:	**Fire Safety Procedures**
Duration:	1.5 Total Hours Theory: 1.5 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.07	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate the ability to follow and practice fire safety according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Practice fire prevention on the worksite.
- clean up worksite and dispose of all debris
- store materials away from overhead power lines
- keep work and travel areas tidy, well lit, and ventilated
- post signs to warn workers of hazardous areas
- keep stairways, passageways and gangways free of obstructions

4.2 Identify where fire extinguishers must be provided.

4.3 Identify the location of fire alarms.

4.4 Determine the potential for fire posed by the work being performed.

4.5 Identify where fire hazardous areas are located.

4.6 Identify fire-extinguishing equipment for specific types of fire.

4.7 Describe procedures to locate and to assess the severity of a fire.

4.8 Describe the measures taken to suppress a minor fire.

4.9 Describe a fire evacuation plan according to the Ontario Fire Prevention Code and company policies and procedures.

Number:	5
Title:	**Hazardous/Toxic Materials**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.08	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify the procedures for selecting, transporting and storing hazardous/toxic materials according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

5.1 Identify procedures for handling flammable liquids.
- state safe and approved methods for transporting
- identify safe and approved storage containers
- identify safe and approved storage locations
- identify and select the required work dress and personal protective equipment

5.2 Identify procedures for handling oxygen and acetylene cylinders.
- describe the correct secured positions during use, storage and transportation
- Identify the type of fire extinguisher required when oxygen and acetylene are on a job site
- identify and select the required work dress and personal protective equipment

5.3 Identify procedures for handling propane cylinders.
- determine the safe and approved method for transporting
- identify safe and approved storage containers
- identify safe and approved storage locations
- identify and select the required work dress and personal protective equipment

5.4 Identify procedures for handling various acids, solvents and cleaners.
- determine the safe and approved method for transporting
- identify and select the required type (s) of respirator apparatus for the hazard
- identify and select the required work dress and personal protective equipment

5.5 Identify procedures for handling asbestos materials.
- describe the hazards associated with asbestos materials
- describe the safe and approved method for working in an area where asbestos is present
- identify and select the required work dress and personal protective equipment

Number:	6
Title:	**Audio-Visual Alarms**
Duration:	1.5 Total Hours Theory: 1.5 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice will be able to demonstrate the ability to recognize and respond to audio-visual alarms according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

6.1 Identify and explain the purpose of all audio-visual alarms including:
- warning signs
- danger notices
- alarm bells
- whistles
- buzzers
- vibrators
- lights

Number:	7
Title:	**Working Within Safe Physical Limits**
Duration:	1.5 Total Hours Theory: 1.5 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.04	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice will be able to demonstrate the ability to protect self and others by working within safe physical limits according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

7.1 Identify and interpret applicable sections of the *Ontario Occupational Health and Safety Act*, company policies and procedures, and any applicable manufacturers' instructions and recommendations.

7.2 Determine safe physical limits using correct body mechanics when bending, lifting, transporting or climbing with heavy loads.

7.3 Determine which conditions would cause personal injury.

Number:	8
Title:	**Working Within Confined Spaces**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.10	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify confined spaces and explain entry and exit procedures according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

8.1 Identify confined space hazards.
- physical
- atmospheric

8.2 Describe the types of physical hazards that involve greater risk inside rather than outside a confined space.

8.3 Describe physical hazards that may cause injury or increase the severity of injury.
- poor access
- cramped working conditions
- temperature extremes
- rotating or moving equipment
- reactive or corrosive residues
- electrical hazards
- movement of liquids or solids in pipes, vessels, etc.

8.4 Identify dangerous atmospheres that may be present in confined spaces.
- explosive
- oxygen enriched or oxygen deficient
- toxic

8.5 Identify the explosive range of a flammable gas or vapor.

8.6 Evaluate a physical hazard once it has been identified.
- inspect the confined space from outside
- identify any equipment that could be activated by stored pressure, accidental contact or gravity action
- discuss proposed action with client and /or plant personnel
- check for exposed electrical conductors or energized apparatus

8.7 Explain procedures for testing and evaluating atmospheric dangerous hazards using special devices before each entry and during work period

- identify detection equipment
- Explain application of the detection equipment
- calibrate, maintain and use detection equipment
- test for too much or to little oxygen and interpret results
- test for combustible or explosive gas and vapors and interpret results
- test for toxic gases or vapors and interpret results

Number:	9
Title:	**Worksite Conditions**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.09	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate the ability to identify the hazards of inappropriate behavior on the worksite and also assess worksite conditions according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

9.1 Identify and assess worksite conditions.
- adequate lighting and ventilation
- confined space entry
- presence of hazardous conditions
- unsafe equipment and materials

9.2 State the procedures to follow when the following worksite conditions are encountered.
- problems with equipment that may endanger the worker or other workers
- any contravention of acts, codes, policies, procedures or standards
- jobsite hazards

9.3 Identify the types of inappropriate behavior that could endanger yourself and/or co-workers on the worksite.

9.4 Identify the types of inappropriate behavior on the worksite that could cause damage to equipment.

Number:	10
Title:	**Lock Out and Tag Equipment**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.11	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to explain lock out, tagging and de-energizing procedures to electrical, mechanical, hydraulic and pneumatic equipment according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

10.1 Determine what conditions would cause mechanical and electrical equipment to be tagged and locked out.

10.2 Describe how to lock out electrical, mechanical, hydraulic and pneumatic equipment.

10.3 Describe tagging procedures of defective mechanical, electrical hydraulic and pneumatic equipment.

10.4 Describe how to remove locked out electrical, mechanical, hydraulic and pneumatic equipment.

10.5 Explain lockout and tagging procedures.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
30%	10%	60%

Minimum Equipment List:

air hood
apron
boots
coveralls
ear plugs and ear muffs
face shield
fall arrest system
filtration mask
fire blanket
fire extinguisher
fire hoses
fire-retardant clothing
gloves
goggles
mask (particle, vapor)
reflector vest
respirator
safety glasses
safety helmet
self-contained breathing apparatus
tag and lock-out devices
travel restraint system
welding partition

Number:	S0422				
Title:	**Tools and Equipment**				
Duration:	9 Total Hours	Theory: 4 Hours		Practical:	5 Hours
Prerequisites:	Reportable Subject S0421				
Co-requisites:	None				

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Hand Tools	3	1	2
2	Power and Hydraulic Tools and Accessories	3	0	3
3	Ladders	1.5	1.5	0
4	Scaffolding Equipment	1.5	1.5	0
	Total Hours	**9**	**4**	**5**

Number	1		
Title:	**Hand Tools**		
Duration:	3 Total Hours	Theory: 1 Hour	Practical: 2 Hours
Cross-Reference to Training Standard: 5445.01			

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify, select, use and maintain hand tools according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify, demonstrate the use of use and maintain various hand tools including: layout and measuring devices
- screwdrivers
- pliers
- nut drivers
- wrenches
- vises and clamps
- hammers
- saws
- files
- drills
- punches
- chisels
- cutters
- reamers
- threaders
- rope

1.2 Identify types of hand tools according to job specifications.
- size and design including number and symbol classification
- application to specific materials
- capacity
- operation

1.3 Identify the methods of assembly and adjustments for various hand tools.

1.4 Describe knots and hitches used on ropes, their applications and safety factors.

1.5 Demonstrate the ability to tie approved knots, bends and hitches.

Number:	2
Title:	**Power and Hydraulic Tools and Accessories**
Duration:	3 Total Hours Theory: 0 Hours Practical: 3 Hours
Cross-Reference to Training Standard:	5445.02

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify, select, use and maintain various power and hydraulic tools according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify and demonstrate the use of various power and hydraulic tools based on the specified types, applications, tolerance and job materials.
- drills
- pipe cutters
- grooving machines
- saws
- threading machines
- hydraulic press
- grinders
- drill press
- chop saws
- gas powered saws

2.2 Identify and select power and hydraulic tool accessories based on the specified types, applications, tolerance, and job materials.

2.3 Identify power and hydraulic tool accessories by model number and/or symbol.

2.4 Identify the power requirements of the tools by checking the voltage, amperage and grounding requirements.

2.5 Identify common hazards related to the use of power and hydraulic tools and accessories.

2.6 Describe safe operation, adjustment, maintenance and storage of power and hydraulic tools and accessories.

Number:	3
Title:	**Ladders**
Duration:	1.5 Total Hours Theory: 1.5 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5445.03	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify, select, use and maintain various ladders according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Identify and use ladders including:
- wooden
- aluminum
- fiberglass
- step
- trestle
- extension

3.2 Describe the safety hazards when using a ladder in the following situations.
- ladders not held, tied off or otherwise secured
- slippery surfaces and unfavorable weather conditions
- weak grip when ascending or descending
- leaning or reaching too far
- placement on poor footing or at improper angles
- high wind conditions
- electrical lines present

3.3 Describe hazards specific to wooden, aluminum and fiberglass ladders.

3.4 Identify defective ladders and explain why they should be taken out of service and tagged for repair or scrapped.

Number:	4
Title:	**Scaffolding Equipment**
Duration:	1.5 Total Hours Theory: 1.5 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5445.04	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to describe the procedures for selecting, erecting, dismantling and maintaining scaffolding according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Describe precautions for erecting stationary and rolling scaffolding.
- worker access
- planked/decked platforms
- platform guardrails
- base plates, connections, and braces
- mooring
- moving

4.2 Determine the required scaffolding system for the job.
- weight of workers, tools, materials, and equipment
- job application
- height required
- duration of work
- pedestrian traffic
- special erection or dismantling problems

4.3 Describe the procedures for inspecting scaffolding and components before and after erection.
- frames, base plates, braces and other structural components
- hooks on manufactured platforms
- splits, knots and dry rot in planks
- de-lamination of laminated veneer planks
- compatibility of components
- enough components for job
- surface supports
- shoring and mooring components

4.4 Describe how to install and dismantle all parts and accessories of scaffolding based on job application and site conditions.

- ground/surface conditions
- variations in surface elevation
- support requirements
- weather conditions
- obstructions
- overhead wires
- building configuration
- tie-in locations and methods

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
0%	50%	50%

Minimum Equipment List:

brushes
compressor
chisels
choker
cutters
die and chasers
die equipment
drills
electrical meters
files
grease gun
grinder and attachments
groovers
hammers
heaters
hydraulic bender
ladders
line-up bars
measuring devices
mechanical pipe-joining equipment
nipple chuck
nut drivers
oil can
paint brushes
pick
pigtail
pipe cutter
pipe stand
pliers
plum bob
power spray-pointing equipment
power vise
pry bar
punches
reamer
rod dies
rope
saws
scrapers
screwdrivers
shovel
sling
snips
socket sets
soldering iron
stand chain block hoist
straight edge
tamper
tapping machine and attachments
testing pump
threading machine
utility knives
vices and clamps
vacuum (wet/dry) water hose
water pump
welding, cutting, brazing equipment
wrenches

Number:	S0423
Title:	**Fabrication of Pipe and Fittings**
Duration:	81 Total Hours Theory: 53 Hours Practical: 28 Hours
Prerequisites:	Reportable Subjects S0421 and S0422
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Site Fabrication Area	3	2	1
2	Steel and Plastic Pipe and Fittings	24	24	0
3	Copper Pipe	6	3	3
4	Piping Installation	36	12	24
5	Hangers, Brackets and Hanger Supports	12	12	0
	Total Hours	**81**	**53**	**28**

Number:	1			
Title:	**Site Fabrication Area**			
Duration:	3 Total Hours	Theory:	2 Hours	Practical: 1 Hour
Cross-Reference to Training Standard: 5447.01				

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to establish a site fabrication area by referencing the site plan and coordinating site activities with other trades according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Describe site meetings and explain their purpose.

1.2 Identify and establish a suitable fabrication area.
- accessibility
- lighting
- traffic flow
- material, equipment handling, and storage
- power supply

Number:	2
Title:	**Steel and Plastic Pipe and Fittings**
Duration:	24 Total Hours Theory: 24 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5446.05, 5448.02	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to prepare steel and plastic pipe and fittings to be fabricated using shop drawings, and take off or cut sheets, so that fabrication process is organized according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Read and interpret basic shop drawings, take off or cut sheets.

2.2 Draw and label basic views of an object.
- plain
- isometric

2.3 Identify piping components and describe their purpose and relationships.
- system riser
- riser
- feed mains
- cross mains
- branch lines
- header

2.4 Describe criteria for selection of steel pipe and fittings.
- schedule numbers and grades
- pressure ratings
- pipe types, sizes and lengths
- end finishes
- protective coatings and linings

2.5 Describe the equipment and techniques used to thread pipe.
- hand tools
- powered threaders
- nipple chucks
- thread cutting lubricants
- thread standards

2.6 Identify the types of threaded pipe fittings and describe their characteristics and applications.
- malleable
- cast iron
- steel
- galvanized
- non-ferrous
- stainless

2.7 Describe the procedures used to join threaded pipe and install fittings.
- brazing
- welding

2.8 Identify types and describe the selection criteria of flanges and their associated fittings and gaskets.

2.9 Identify the selection criteria for types of grooved and grip-style pipe fittings and gaskets and explain the procedures used to join them to pipe.
- markings
- materials and types
- color coding of gaskets
- pressure and temperature ratings

2.10 Identify the selection criteria for plastic pipe and describe the types of fittings and solvents used in joining applications.
- types
- sizes
- pressure and temperature ratings

2.11 Describe the procedures used to join plastic pipe using the solvent welding process.
- safety requirements
- fabrication process and materials
- drilling and cleaning
- assembly
- tools
- ventilation
- cure times
- testing

Number:	3
Title:	**Copper Pipe**
Duration:	6 Total Hours Theory: 3 Hours Practical: 3 Hours
Cross-Reference to Training Standard: 5446.05	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to prepare and assemble copper pipe for fabrication using shop drawings, and take off or cut sheets, according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Describe criteria for selection of copper pipe.
- types
- schedule numbers and grades
- pressure ratings
- sizes and lengths
- end finishes
- codes
- manufacturers' specifications
- manufacturing techniques

3.2 Describe the tools, equipment and techniques used to join copper pipe.
- brazing
- soldering
- compression
- flaring

3.3 Describe selection criteria for solders and brazing alloys.
- types
- pressure rating
- temperature rating
- application

3.4 Identify and apply types of flux used in soldering or brazing and describe their purpose, applications and effects.

3.5 Apply procedures used to solder or braze joints.

- types of torches, both fuel and electric
- torch and tip selection
- code interpretation and application

Number:	4
Title:	**Piping Installation**
Duration:	36 Total Hours Theory: 12 Hours Practical: 24 Hours
Cross-Reference to Training Standard: 5447.03	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to prepare and install piping from approved drawings and fabrication sheets according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Prepare and install fabricated piping from approved shop drawings.
- measure
- cut
- thread
- groove
- weld
- solder
- braze

4.2 Demonstrate use of tools and equipment to complete fabrication.
- tapes
- cutters
- threaders
- groovers
- drills
- welding equipment

4.3 Prepare material listing sheet for a 90° piping project.

4.4 Prepare material listing sheet and fabricate a 45° piping installation project.

Number:	5
Title:	**Hangers, Brackets, and Hanger Supports**
Duration:	12 Total Hours Theory: 12 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5447.04, 5448.04	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to select brackets and hanger supports so that pipe installations are completed according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

5.1 Identify types of hangers used in the installation of pipe and describe their characteristics and applications.

5.2 Identify sway bracing and describe its applications.

5.3 Identify types of protective materials applied to hangers and describe their purpose and applications.

5.4 Identify hanger requirements for various piping systems.

5.5 Describe procedures used to install fasteners and inserts.

5.6 Identify types and sizes of hanger rod and describe their applications.

5.7 Identify tools and procedures used for installation of hangers and supports.

5.8 Describe installation requirements for hangers, supports and bracing including:
- angle irons
- pipe trapeze bars
- rings, rods, fastening devices

5.9 Identify seismic bracing and sleeving requirements.

5.10 Identify hanger requirements for installation of residential systems.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
45%	30%	25%

Minimum Equipment List:

adapter fittings
bench vice
calibrating gauge
calculator
calipers
computer brushes
chisels
choker
compressor
cutters
depth gauge
die and chasers
die equipment
drafting equipment
drills
electrical meters
feeler gauge
files
flaring tool
grease gun
grinder and attachments
groovers
hammers
heaters
hoses
hydraulic bender
ladders
laser, magnetic and spirit levels
line-up bars
measuring devices
mechanical pipe-joining equipment
nipple chuck
nut drivers
oil can
paint brushes
pick
pigtail
pipe cutter
pipe stand
pliers
plum bob
power spray-pointing equipment
press fit
power vise
pry bar
punches
reamer
rod dies
rope
saws
scrapers
screwdrivers
shovel
sling
snips
socket sets
soldering iron
square
straight edge
stand chain block hoist
T-drill
tamper
tape measure
tapping machine and attachments
test blanks
testing pump
thread depth gauge
threading machine
torgue wrench
utility knives
vices and clamps
vacuum (wet/dry)
water hose
water pump
welding, cutting, brazing equipment
wrenches

Number:	S0424
Title:	**Fire Protection Systems and Devices**
Duration:	120 Total Hours Theory: 120 Hours Practical: 0 Hours
Prerequisites:	None
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Check, Control and Drain Valves	18	18	0
2	Standard Spray Sprinkler Heads	24	24	0
3	Wet Pipe Fire Protection System	18	18	0
4	Anti-Freeze Fire Protection System	9	9	0
5	Dry Pipe Fire Protection System	24	24	0
6	Pre-Action and Deluge Fire Protection System	18	18	0
7	Combined Dry Pipe and Pre-Action Fire Protection System	9	9	0
	Total Hours	**120**	**120**	**0**

Number:	1
Title:	**Check, Control and Drain Valves**
Duration:	18 Total Hours Theory: 18 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5448.02, 5448.03, 5448.05	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to select and identify check, control and drain valves according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify types of valves and describe their operation and applications.
- ball
- butterfly
- check
- gate
- globe
- alarm
- dry
- pressure reducing
- pressure relief
- test and drain
- indicating/non-indicating drain
- water post indicators
- quick opening devices
- pre-action and deluge

1.2 Describe major design variations and construction features of valves.

1.3 Identify indicating valves and explain their operation.

1.4 Describe the procedures for installation and maintenance of valves.

- ball
- butterfly
- check
- gate
- globe
- alarm
- dry
- pressure reducing
- pressure relief
- test and drain
- wall post indicators
- quick opening devices
- pre-action and deluge

Number:	2
Title:	**Standard Spray Sprinkler Heads**
Duration:	24 Total Hours Theory: 24 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5443.01, 5443.02, 5443.03, 5444.04, 5451.01, 5449.05, 5449.06, 5449.07, 5449.08, 5449.09, 5449.10

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify and select a range of commonly used standard spray sprinkler heads according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify the various categories and listing information on standard spray sprinkler heads.
- solder
- bulb
- open

2.2 Identify temperature ratings and color coding.
- fusible link
- glass bulb
- decorative

2.3 Identify the performance characteristics that apply to standard spray sprinkler heads.
- deflector design/spray patterns
- orifice sizes
- temperature rating
- temperature sensitivity
- orientation

2.4 Identify standard spray sprinkler head symbols used on blueprints, spools and other piping drawings.

2.5 Describe methods for protection of standard spray sprinkler heads.
- shipping
- unpacking
- storage
- installation

2.6 Identify factors that affect maximum ceiling temperature.

2.7 Explain the procedures for installing standard spray sprinkler heads.

2.8 Explain the location requirements of standard spray sprinkler heads in relation to:

- bays
- beams
- girders
- joists
- open bar joists
- open ceilings
- trusses
- storage materials

2.9 Identify required distances between sprinkler heads for specific hazards.

- light hazard
- ordinary hazard
- extra hazard

Number:	3
Title:	**Wet-Pipe Fire Protection System**
Duration:	18 Total Hours Theory: 18 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.05	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the requirements for the installation of wet-pipe fire protection system according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Identify wet-pipe sprinkler system and describe its operating principles and characteristics for commercial, industrial and residential structures.

3.2 Describe the advantages of a wet-pipe sprinkler system.

3.3 Explain the procedures for installing and removing components of wet-pipe sprinkler system.

3.4 Describe methods for preventing false alarms on a wet-pipe sprinkler system.

Number:	4
Title:	**Anti-Freeze Fire Protection Systems**
Duration:	9 Total Hours Theory: 9 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the requirements for the installation of an anti-freeze fire protection system according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Describe the characteristics of anti-freeze fire protection system.

4.2 Explain freezing protection of sprinkler controls and systems.

4.3 Describe how sprinkler systems using anti-freeze solutions operate.

4.4 Describe the procedures to follow for compliance with state and local regulations concerning the use of anti-freeze solutions in a sprinkler system.
- types of solutions
- potable water supply
- non-potable water supply
- cross-connections

4.5 Describe how to determine and prepare appropriate anti-freeze solutions for varying freezing temperatures.

4.6 Describe the procedures for installing an anti-freeze sprinkler system.
- total capacity
- anti-freeze loop
- cross connection control

4.7 Explain how to fill systems that employ anti-freeze solutions.

Number:	5
Title:	**Dry Pipe Fire Protection System**
Duration:	24 Total Hours Theory: 24 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.07	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the requirements for the installation of dry-pipe fire protection system according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

5.1 Identify dry-pipe sprinkler system and describe its operating principles and characteristics.

5.2 Describe the special requirements for arranging, installing, maintaining and inspecting dry-pipe systems that protect unheated areas.

5.3 Identify components of dry pipe sprinkler systems and describe their location, purpose and operation.

5.4 Describe methods for preventing false alarms on a dry-pipe sprinkler system.

Number:	6
Title:	**Pre-Action and Deluge Fire Protection Systems**
Duration:	18 Total Hours Theory: 18 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5449.09

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the requirements for the installation of pre-action and deluge systems according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

6.1 Identify the components pre-action and deluge systems and their applications.

6.2 Identify the activation methods for pre-action and deluge system detection lines.
- pneumatic
- hydraulic
- electric

6.3 Describe the procedures for installing pre-action and deluge systems.
- single interlock
- double interlock
- non-interlocking

6.4 Explain the requirements for drainage of pre-action and deluge systems.

Number:	7
Title:	**Combined Dry-Pipe and Pre-action Fire Protection Systems**
Duration:	9 Total Hours Theory: 9 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5449.08

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation requirements for combination dry-pipe and pre-action systems according to all applicable acts, codes, policies, procedures, and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

7.1 Describe the circumstances that require combined dry-pipe and pre-action systems.

7.2 Describe the distinguishing characteristics of a combined dry-pipe and pre-action sprinkler system.

7.3 Explain the function of dry-pipe and air exhaust valves in combined systems.

7.4 Describe the requirements for dividing combined systems using check valves.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	0%	25%

Minimum Equipment List:

adapter fittings
backflow devices
ball, butterfly, check, gate, and globe valves
bench vice
calculator
calibrating gauge
calipers
computer
depth gauge
drafting equipment
feeler gauge
flaring tool
hoses
hydrometer
indicating/non-indicating drain
laser, magnetic and spirit levels
press fit,
pressure reducing valves
pressure relief valves
pipe stand
quick opening devices
refractometer test and drain valves
square
straight edge
T-drill
tape measure
test blanks
thread depth gauge
torque wrench
variety of standard spray sprinkler heads
water post indicators
wet, dry, deluge and pre-action alarm valves & trim

Level 1 - Summary of Minimum Recommended Equipment

air hood
apron
adapter fittings
backflow devices
bench vice
boots
brushes
ball valves
butterfly valves
check valves
coveralls
compressor
choker
calibrating gauge
calculator
calipers
computer
cutters
chisels
die and chasers
drills
depth gauge
drafting equipment
die equipment
ear plugs and ear muffs
electrical meters
files
face shield
fall arrest system
filtration mask
fire blanket
fire extinguisher
fire hoses
fire-retardant clothing
feeler gauge
flaring tool
gate and globe valves
goggles
grease gun
groovers
grinder and attachments
hydraulic bender
hoses
hammers
heaters gloves
hydrometer
indicating/non-indicating drain
line-up bars
ladders
laser, magnetic and spirit levels
mask (particle, vapor)
mechanical pipe-joining equipment
measuring devices
nipple chuck
nut drivers
oil can
press fit
pressure reducing valves
pressure relief valves
pipe cutter
pipe stand
paint brushes
pick
pigtail
pliers
plum bob
pry bar
power spray-pointing equipment
power vise
punches
quick opening devices
refractometer test and drain valves
rod dies
rope
reamer
reflector vest
respirator
safety glasses
safety helmet
self-contained breathing apparatus
sling
saws
stand chain block hoist
scrapers
screwdrivers
shovel
snips
socket sets

soldering iron
square

straight edge
T-drill
tape measure
test blanks
thread depth gauge
torgue wrench
tamper
tag and lock-out devices
travel restraint system
tapping machine and attachments
testing pump
threading machine
utility knives
vices and clamps
vacuum (wet/dry)
variety of standard spray sprinkler heads
water post indicators
wet, dry, deluge and
pre-action alarm valves & trim
water hose
welding partition
welding, cutting, brazing equipment
water pump
wrenches

Level 2

Number:	S0425
Title:	**Rigging, Framing and Hoisting**
Duration:	12 Total Hours
	Theory: 9 Hours Practical: 3 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Rigging, Framing and Hoisting Equipment and Materials	9	6	3
2	Loading and Unloading Equipment and Materials	3	3	0
	Totals	**12**	**9**	**3**

Number:	1
Title:	**Rigging, Framing and Hoisting Equipment and Materials**
Duration:	9 Total hours Theory: 6 hours Practical: 3 hours
Cross-Reference to Training Standard: 5442.01, 5442.03, 5442.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate knowledge of rigging, framing and hoisting equipment and the procedures for its use according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify rigging, framing and hoisting equipment and describe their applications and safe working loads.

- cable clamps
- chain block hoist
- chains
- choker
- come-alongs (cable or chain)
- fork-lift
- jacks
- overhead hoist
- pipe buggy
- pipe stand
- portable boom
- shackles
- slings
- spreader bar
- tugger
- ratchet lever hoist
- light duty hand hoist
- medium duty spur geared hand hoist
- standard single chain arrangement
- double chain arrangement

1.2 Describe types of ropes and slings, their characteristics and applications.

- natural
- synthetic
- wire

1.3 Explain purpose and the procedures for using the following equipment when framing and hoisting loads.
chain falls

- come-along
- jacks
- trolleys
- latch and matchlock hooks
- slings
- shackles
- clevises
- power lifts
- leveling equipment
- fastening equipment
- safety equipment

1.4 Explain how to disconnect, remove and secure lifting devices and equipment.

1.5 Explain how and where to store the rigging, framing and hoisting equipment.

Number:	2
Title:	**Loading and Unloading Equipment and Materials**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5442.02, 5442.04, 5442.05	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate knowledge of loading and unloading equipment and materials according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Describe how to secure and barricade the area(s) for rigging, framing and hoisting operations.

2.2 Explain how to coordinate with other trades when preparing for rigging, framing and hoisting operations.

2.3 Demonstrate the use of international hand signals.

2.4 Demonstrate the use of standard weight tables to determine the weight of a given load.

2.5 Describe how to load, move and unload equipment and materials.
- calculation of weight of load
- equipment selection
- equipment setup
- slinging
- load placement
- securing load

2.6 Identify when special rigging or hoisting may be required for given materials or pieces of equipment.

2.7 Explain the inspection procedures for rigging, framing and hoisting equipment and describe conditions that warrant inspections.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
0%	25%	75%

Minimum Equipment List:

cable clamps
chain block hoist
chains
choker
come-alongs
jack
ladders
pipe stand
portable boom
rope
scaffolding
shackles
slings

Number:	S0426
Title:	**Installation of Water Supply**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424 and S0425
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Site Excavation	3	3	0
2	Underground Piping	6	6	0
3	Thrust Blocks and Restraining Devices	9	9	0
4	Hydrants and Control Valves	12	12	0
5	Water Supply Sources	30	30	0
6	Backflow Prevention	15	15	0
	Total Hours	**75**	**75**	**0**

Number:	1
Title:	**Site Excavation**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5446.01, 5446.02	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the procedures for excavating the installation site according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Investigate local, regional and provincial restrictions and requirements for site excavation.

1.2 Describe the procedure for determining the location of existing utility lines.
- hydro
- telephone
- cable
- gas
- water
- site services

1.3 Describe various shoring systems and how soil type affects shoring of trenches.
- hydraulic
- timber
- trench box

1.4 Explain when shoring is to be installed in the excavation process.

1.5 Explain the guidelines for placement of shoring and excavation tools, equipment, materials, soil and barricades.

1.6 Describe the situations that affect trench stability causing cave-ins.

1.7 Explain why trench shoring, ground surface and adjacent areas should be inspected regularly.

Number:	2		
Title:	**Underground Piping**		
Duration:	6 Total Hours	Theory: 6 Hours	Practical: 0 Hours
Cross-Reference to Training Standard: 5446.05, 5446.08, 5448.01			

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to identify the methods of installing underground piping according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Describe the various types of pipe and joining methods used when installing a private fire service main.

2.2 Describe factors to be considered in determining the class and type of pipe for a particular job.
- working pressure
- laying conditions
- soil conditions
- corrosion
- external loads

2.3 Describe the factors that govern laying and protecting underground piping in private fire service mains.

2.4 Describe testing and flushing procedures for new and existing underground piping.

2.5 Explain how and when shoring is to be installed within the excavation process.

2.6 Describe the situations that affect trench stability cause cave-ins.

2.7 Explain why trench shoring, ground surface and areas adjacent should be inspected regularly.

Number:	3
Title:	**Thrust Blocks and Restraining Devices**
Duration:	9 Total Hours Theory: 9 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5446.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to describe installation of thrust blocks and restraining devices according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Describe the approved methods and devices used to restrain fire service mains against movement.

3.2 Explain how the type of pipe, soil conditions and available space determine the restraining method to be used.

3.3 Explain the purpose of cleaning and coating restraining devices with corrosion-retarding materials.

3.4 Explain that concrete thrust blocks are utilized in combination with tie rods, structural anchoring, thrust collars, and restrained joints.

Number:	4		
Title:	**Hydrants and Control Valves**		
Duration:	12 Total Hours	Theory: 12 Hours	Practical: 0 Hours
Cross-Reference to Training Standard: 5446.07			

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the procedures for the installation of hydrants and control valves including yard and wall hydrants in accordance with drawings and specifications and according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Describe two types of hydrants commonly used in private fire service mains and under what conditions they are installed.

4.2 Describe the functions of the various parts of the hydrants.

4.3 Determine the location to hydrants in private fire service mains.

4.4 Explain how to set, maintain and test fire hydrants.

4.5 Describe care and maintenance procedures for fire hydrants.
- lubrication
- painting
- flushing
- hydrant housing
- freezing prevention
- checking for leaks
  - main valve
  - drip valve
  - water mains

4.6 Describe installation requirements for hydrant houses.

Number:	5
Title:	**Water Supply Sources**
Duration:	30 Total Hours Theory: 30 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5444.01, 5444.02, 5444.03, 5444.04, 5446.03 5446.04, 5446.09

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine water supply from plans and water flow test data according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

5.1 Describe the characteristics and properties of water.

5.2 Describe types of water supply used for sprinkler and hose systems.
- municipal
- tanks
- reservoir

5.3 Describe installation procedures for alternative water supply.

5.4 Describe pump requirements for alternative water supply.

5.5 Explain the relationship of occupancy classification to water supply requirements.

5.6 Describe fire department connections and their installation requirements.
- sizing
- hose thread connections
- check valves
- additional components

5.7 Describe flow test procedure used to determine water flow data for fire protection systems.

5.8 Determine weights and volumes of cylinders and rectangular tanks or reservoirs.n strategies for air conditioning applications.

Number:	6
Title:	**Backflow Prevention**
Duration:	15 Total Hours Theory: 15 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5446.10	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to recognize cross-connection points and the proper backflow prevention application for each situation according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

6.1 Explain the purpose of backflow and cross-connection valves to maintain the integrity of the potable water source.
- health hazards
- liability

6.2 Describe regulations and codes relating to cross connection control and back flow prevention devices on fire protection systems.
- installation
- maintenance
- testing

6.3 Determine the type of backflow prevention requirements for specific fire protection systems.
- raw water source
- automatic source drawing raw
- systems containing additives

6.4 Describe the procedures and components required when installing double backflow prevention valves.
- double check
- reduced-pressure

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	0%	25%

Minimum Equipment List:

backflow devices
brushes
chisels
choker
clamps
compressor
cutters
drills
die and chasers
die equipment
electrical meters
files
flanges glands
gaskets
grease gun
grinder and attachments
groovers
hammers
heaters
hubs
hydrant
hydraulic bender
ladders
line-up bars
measuring devices
mechanical pipe-joining equipment
nipple chuck
nut drivers
oil can
paint brushes
pick
pigtail
pipe cutter
pipe stand
pliers
plum bob
power spray-pointing equipment
power vise
pry bar
punches
reamer
restraining glands
rodding
rod dies
rope
rubbers
saws
scrapers
screwdrivers
shovel
sling
snips
socket sets
soldering iron
stand chain block hoist
T-bolts
tamper
tapping machine and attachments
testing pump
threading machine
underground joints
underground valves
utility knives
vacuum (wet/dry)
vices and clamps
water hose
water pump
welding, cutting, brazing equipment
wrenches

Number:	S0427			
Title:	**Standpipe Fire Protection System**			
Duration:	24 Total Hours	Theory:	24 Hours	Practical: 0 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424			
Co-requisites:	None			

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Installation of Standpipe Fire Protection System	18	18	0
2	Testing and Maintenance of Standpipe Fire Protection System	6	6	0
	Total Hours	**24**	**24**	**0**

Number:	1		
Title:	**Installation of Standpipe Fire Protection System**		
Duration:	18 Total Hours	Theory: 18 Hours	Practical: 0 Hours
Cross-Reference to Training Standard:	5449.04		

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation requirements of a standpipe system and components according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Determine the installation requirements of a combined sprinkler-standpipe system.
- cross-zoning
- pipe sizing

1.2 Describe the characteristics of standpipe classifications.
- Class I
- Class II
- Class III

1.3 Describe the installation requirements for the different standpipe classifications.
- Class I
- Class II
- Class III

Number:	2
Title:	**Testing and Maintenance of Standpipe Fire Protection System**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5453.0, 5450.0	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the testing and maintenance requirements of a standpipe system and components according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Explain the procedures for the routine inspection and testing of standpipe and hose systems.
- acceptance
- inspection

2.2 Describe the checkpoints and corrective actions used to determine that hose and components are free of corrosion, foreign material, physical damage, water damage, tampering, or other conditions that could prevent operation.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
50%	0%	50%

Minimum Equipment List:

adapter fittings
brushes
calibrating gauge
chisels
choker
cutters
compressor
die and chasers
die equipment
drills
electrical meters
files
fire hoses
fire hose cabinets
fire hose valves grease gun
grinder and attachments
groovers
hammers
heaters
hose support brackets
hose valve wrenches
hydraulic bender
ladders
line-up bars
measuring devices
mechanical pipe-joining equipment
nipple chuck
nozzles
nut drivers
oil can
paint brushes
pick
pigtail
pipe cutter
pipe stand
Pitot tubes
play pipes
pliers
plum bob
power spray-pointing equipment
power vise
pressure gauge kit
pressure reducing valves
pry bar
punches
reamer
restrictive orifice disc
rod dies
rope
saws
scrapers
screwdrivers
shovel
sling
snips
socket sets
soldering iron
stand chain block hoist
tamper
tapping machine and attachments
testing pump
threading machine
utility knives
vacuum (wet/dry)
vices and clamps
water hose
water pump
water stops
welding, cutting and brazing equipment
wrenches

Number:	S0428
Title:	**Specific Application Sprinkler Heads**
Duration:	30 Total Hours Theory: 30 Hours Practical: 0 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Installation of Specific Application Sprinkler Heads	30	30	0
	Total Hours	**30**	**30**	**0**

Number:	1
Title:	**Installation of Specific Application Sprinkler Heads**
Duration:	30 Total Hours Theory: 30 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5449.01, 5449.02, 5449.03, 5449.05, 5449.06, 5449.07, 5449.08, 5449.09, 5449.10, 5449.11, 5451.01, 5451.02, 5443.0

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to select a variety of specific application sprinkler heads according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify specific application sprinkler heads and describe their characteristics and applications.
- early suppression fast response (ESFR)
- quick response early suppression (QRES)
- old-style/conventional
- extended coverage
- large drop
- in-rack
- attic
- nozzles
- open sprinkler
- window
- on/off
- dry sidewall
- dry upright
- dry pendant
- residential

1.2 Identify the performance characteristics that apply to specific application sprinkler heads.
- deflector design/spray patterns
- orifice sizes
- temperature rating
- temperature sensitivity
- orientation

1.3 Identify specific application head symbols used on blueprints, spools and other piping drawings.

1.4 Describe methods for protection of specific application sprinkler heads.
- shipping
- unpacking
- storage
- installation

1.5 Identify factors that affect maximum ceiling temperature.

1.6 Explain the procedures for installing specific application sprinkler heads.

1.7 Explain the location requirements of specific application sprinkler heads in relation to:
- bays
- beams
- girders
- joists
- open bar joists
- open ceilings
- trusses
- storage materials

1.8 Identify required distances between specific application sprinkler heads for specific hazards.
- light hazard
- ordinary hazard
- extra hazard

1.9 Identify sprinkler deflector orientation and location.
- low-pitched roofs
- partitions
- peaks
- roofs
- stair and ramps

1.10 Identify clearances required between piled storage materials and sprinkler deflectors.

1.11 Identify the installation requirements for special situations.

- concealed spaces
- vertical shafts
- stairways
- vertical openings
- building service shafts
- elevator hoists ways and machine rooms
- spaces in underground floors
- exterior docks and platforms
- exterior roofs or canopies
- dwelling units
- library stockrooms
- electrical equipment
- ceilings types
- fire curtains

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
50%	0%	50%

Minimum Equipment List:

specific application sprinkler heads
specialty sprinkler head wrenches

Number:	S0429
Title:	**Inspection, Testing and Maintenance Fire Protection Systems**
Duration:	63 Total Hours Theory: 35.5 Hours Practical: 27.5 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424 and S0428
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Installation and Maintenance of Tamper, Flow and Pressure Devices	6	4	2
2	Trim Wet and Dry Pipe Valves	27	6	21
3	Shutdown of Fire Protection System	6	6	0
4	Inspection, Testing and Maintenance of Sprinkler Heads	3	3	0
5	Inspection and Testing of Sprinkler System Components	6	6	0
6	Installation and Service of Portable Extinguishers	3	3	0
7	Maintenance of Portable Extinguisher Components	3	1.5	1.5
8	Restore Fire Protection Systems	3	3	0
9	Troubleshoot Fire Protection Systems	6	3	3
	Total Hours	**63**	**35.5**	**27.5**

Number:	1
Title:	**Installation and Maintenance of Tamper, Flow and Pressure Devices**
Duration:	6 Total Hours Theory: 4 Hours Practical: 2 Hours
Cross-Reference to Training Standard:	5451.05

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to select, install and maintain tamper, flow and pressure devices for fire protection systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Install or test alarm devices using standard or specialized tools and equipment.

- tamper switches
- low air and water pressure switches
- low water level switches
- low and high temperature switch
- loss of power switch
- paddle flow switches
- water motor gong

Number:	2
Title:	**Trim Alarm and Dry Pipe Valves**
Duration:	27 Total hours Theory: 6 Hours Practical: 21 Hours
Cross-Reference to Training Standard:	5449.01, 5449.02, 5449.03, 5449.04, 5449.05, 5449.06, 5449.07, 5449.08, 5449.09, 5449.10, 5449.11, 5443.02, 5443.03, 5454.06, 5454.08

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to trim, test and reset alarm and dry pipe valves according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify alarm valves to be trimmed and their relevant design characteristics.

2.2 Perform installation of alarm valve trim.
- location of alarm valves
- trim and accessories required

2.3 Identify dry pipe valves to be trimmed and describe their relevant design characteristics.
- location of dry pipe valves
- trim and accessories required

2.4 Select dry pipe valve trim components.

2.5 Perform installation of dry pipe valve trim.

2.6 Describe procedures used to test and reset alarm and dry pipe valves.

2.7 Develop an isometric drawing of wet valve and dry valve installations.

Number:	3			
Title:	**Shutdown of Fire Protection System**			
Duration:	6 Total hours	Theory:	6 Hours	Practical: 0 Hours
Cross-Reference to Training Standard: 5453.0				

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine shut down procedures prior to servicing, shutting down and restoring to service fire protection systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Determine the shut down requirements of fire protection system for job application.

3.2 Explain how authorities are notified prior to servicing or shut down of the fire protection system.
- local fire department
- insurance organization
- client or client representative
- monitoring companies

3.3 Explain why the authority having jurisdiction, the fire department and the alarm receiving facility shall be notified when the system, supply, or component is returned to service.

Number:	4
Title:	**Inspection, Testing and Maintenance of Sprinkler Heads**
Duration:	3 Total hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5454.01, 5454.02, 5454.03, 5454.04, 5454.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to visually inspect the sprinkler heads and related piping to assess system condition and determine deficiencies prior to performing tests according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Identify the service/maintenance requirements in accordance with manufacturer's data sheets.
- preventative maintenance
- corrective maintenance
- emergency maintenance

4.2 Visually inspect sprinkler heads and related piping for the following:
- corrosion
- foreign materials
- paint
- orientation
- spacing

4.3 Determine that proper spacing has been applied and that obstruction does not exist.

4.4 Determine the type of heads used throughout the site and the date of installation.

4.5 Determine the supply of spare sprinkler heads is adequate and the proper wrenches available.

Number:	5
Title:	**Inspection and Testing of System Components**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5454.01, 5454.02, 5454.03, 5454.04, 5454.05, 5454.06, 5454.07, 5454.09

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to visually inspect and test sprinkler system components according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

5.1 Identify the service/maintenance requirements in accordance with manufacturer's data sheets.
- preventative maintenance
- corrective maintenance
- emergency maintenance

5.2 Determine the condition of system piping and fittings.
- mechanical damage
- leakage
- misalignment
- corrosion
- external loads

5.3 Determine condition and spacing of hangers and braces.
- load
- attachment requirements
- seismic

5.4 Describe the location and position of gauges in relationship to fire protection systems.

5.5 Describe the range capabilities of all gauges.

5.6 Describe testing procedures of gauges.

Number:	6
Title:	**Installation and Service of Portable Extinguishers**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5452.01, 5452.02	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to select portable extinguishers according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

6.1 Identify the service/maintenance requirements in accordance with manufacturer's data sheets.
- preventative maintenance
- corrective maintenance
- emergency maintenance

6.2 Identify portable fire extinguishers and describe their characteristics.
- carbon dioxide
- water and dry chemical
- clean agent

6.3 Describe the installation procedures applicable to given site locations.
- determine applicable type
- number of units
- spacing

6.4 Describe testing procedures for portable extinguishers.
- tagging the date of inspection
- evaluate condition of extinguishers
- recording inspection date

Number:	7		
Title:	**Maintenance of Portable Extinguisher Components**		
Duration:	3 Total Hours	Theory: 1.5 Hours	Practical: 1.5 Hours
Cross-Reference to Training Standard: 5452.03, 5452.04			

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to maintain portable extinguisher components and recharge extinguishers according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

7.1 Identify the service/maintenance requirements in accordance with manufacturer's data sheets.
- preventative maintenance
- corrective maintenance
- emergency maintenance

7.2 Repair and/or replace broken or defective parts of extinguisher components.
- broken seals
- gauges
- brackets
- nozzles
- hoses
- cylinders

7.3 Recharge extinguishers using approved materials and methods.

Number:	8
Title:	**Restore Fire Protection Systems**
Duration:	3 Total Hours Theory: 3 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5453.01, 5453.05, 5454.02, 5454.08	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to restore the operation of the fire protection system and complete required test reports according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

8.1 Verify that the operation of the fire protection system has been restored.
- document correction of identified problems
- report items repaired or replaced
- report work completed
- notify appropriate authorities

8.2 Prepare the required documentation of inspecting, testing and maintenance activities on fire protection systems and components.

Number:	9
Title:	**Troubleshoot the Fire Protection System**
Duration:	6 Total Hours Theory: 3 Hours Practical: 3 Hours
Cross-Reference to Training Standard: 5453.01, 5453.02	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to troubleshoot the fire protection system according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

9.1 Listen and interpret client's concerns.

9.2 Read and interpret previous records, inspection forms, reports or logs pertaining to problems.

9.3 Conduct a visual inspection to verify the fire system components are operational and free from physical damage.

9.4 Verify system problem and determine probable solutions.

9.5 Identify the service/maintenance requirements in accordance with manufacturer's data sheets.
- preventative maintenance
- corrective maintenance
- emergency maintenance

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
35%	40%	25%

Minimum Equipment List:

amp/volt meter
anti-freeze solutions
backflow devices
battery load tester
binoculars
boots
brushes
calibrated gauge
compressor
computer
coveralls
dry pipe and deluge valves
ear plugs and ear muffs
face shield
fall arrest system
filtration mask
fire extinguisher
fire hoses
flow meter
gloves
goggles
grease gun
hammers
heaters
heat lamp
hoses
hydrometer
ladders
mask (particle, vapor)
oil can
paint brushes
pick
Pitot tubes
play pipes
pliers
plum bob
protomatic test pump
pry bar
reflector vest
refractometer
respirator
RPM reader
safety glasses
safety helmet
scrapers
screwdrivers
self-contained breathing apparatus
shovel
site tube
socket sets
soldering iron
standard spray sprinkler heads
stop watch
tachometer
tag and lock-out devices
temperature gauge
test blanks
testing pump
travel restraint system
utility knives
vacuum (wet/dry)
vice-grip
water hose
wet pipe alarm valves
wrenches

Number:	S0430			
Title:	**Installation of Piping Offsets**			
Duration:	36 Total Hours	Theory:	36 Hours	Practical: 0 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424			
Co-requisites:	None			

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Installation of Rolled Offsets	6	6	0
2	Installation of Linear and Travel Pipe Lengths	30	30	0
	Total Hours	**36**	**36**	**0**

Number:	1
Title:	**Installation of Rolled Offsets**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5443.03, 5443.06, 5447.02, 5447.03	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to perform the calculations of rolled offsets according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Describe types of triangles and their characteristics.
- lengths of sides
- sum of angles
- squaring of sides

1.2 Calculate the required lengths for specific applications.
- wall brackets
- swing joints
- ladder angles
- slings

Number:	2
Title:	**Installation of Linear and Travel Pipe Lengths**
Duration:	30 Total Hours Theory: 30 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5443.03, 5443.06, 5447.02, 5447.03	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to perform piping offset calculations according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Perform piping offset calculations for 90° and 45° fittings.
- offset travel
- offset advancement

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	0%	25%

Minimum Equipment List:

Calculator

Level 2 – Summary of Minimum Recommended Equipment

adapter fittings
air monitoring device
amp/volt meter
anti-freeze solutions
backflow devices
back-flushing machine
battery load tester
binnoculars
boots
brushes
cable clamps
calibrated gauge
chains
chain block hoist
chisels
choker
clamps
come-alongs
compressor
computer
coveralls
cutters
deluge valves
die and chasers
die equipment
drills
dry pipe valves
ear plugs and ear muffs
electrical meters
face shield
fall arrest system
files
filtration mask
fire extinguisher
fire hoses
fire hose cabinets
fire hoses nozzles
fire hose valves
flanges
flow meter
gaskets
grease gun
glands
goggles
grinder and attachments
groovers
hammers
heaters
heat lamp
hoses gloves
hose support brackets
hose valve wrenches
hubs
hydraulic bender
hydrant
hydrometer
jack
line-up bars
ladders
mask (particle, vapor)
measuring devices
mechanical pipe-joining equipment
nipple chuck
nut drivers
oil can
paint brushes
pick
pigtail
pipe cutter
pipe stand
Pitot tubes
play pipes
pliers
plum bob
portable boom
power spray-pointing equipment
power vise
pressure gauge kit
pressure reducing valves
protomatic test pump
pry bar
punches
reamer
refractometer
reflector vest
respirator
restraining glands
restrictive orifice disc
rod dies
rodding
rope
RPM reader

rubbers
safety glasses
safety helmet
saws
scaffolding
scrapers
screwdrivers
self-contained breathing apparatus
shackles
shovel
site tube
slings
snips
socket sets
soldering iron
specialty sprinkler
head wrenches
specific application sprinkler heads
standard spray sprinkler heads
stand chain block hoist
stop watch
tachometer
T-bolts
tag and lock-out devices
tamper
tapping machine and attachments
temperature gauge
test blanks
testing pump
threading machine
travel restraint system
two-way radio
underground joints
underground valves
utility knives
vacuum (wet/dry)
vices and clamps
water hose water hose
water pump
water stops
welding, cutting, brazing equipment
wet pipe alarm valves
wrenches

Level 3

Number:	S0431
Title:	**Design Systems**
Duration:	48 Total Hours Theory: 36 Hours Practical: 12 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424, S0425, S0426, S0427, S0428, S0429, S0430
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Occupancy Classification & Design Criteria	12	12	0
2	System Hydraulic Calculations	24	24	0
3	Design Documentation	12	0	12
	Total Hours	**48**	**36**	**12**

Number:	1
Title:	**Occupancy Classification and Design Criteria**
Duration:	12 Total Hours Theory: 12 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5444.01

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine occupancy classification and design criteria according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 List and describe the classifications of occupancies.

1.2 Identify special occupancy conditions.
- high piles of combustible stocks
- flammable and combustible liquids
- combustible dusts and fibers
- large quantities of light, loose combustible materials
- chemicals and explosives

1.3 Identify hazard categories and describe their characteristics.
- light
- ordinary
- extra
- unique content

1.4 Explain how a building’s occupancy classification affects the design criteria of the sprinkler system and water supply.

Number:	2			
Title:	**System Hydraulic Calculations**			
Duration:	24 Total Hours	Theory:	24 Hours	Practical: 0 Hours
Cross-Reference to Training Standard: 5444.04				

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to perform system hydraulic calculations to determine friction loss and pipe sizing needed to meet the water flow requirements of the design criteria according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Describe the basic principles of physics as they are applied to the sprinkler trade.
- specific weight
- specific gravity
- difference between pressure and total force
- total force applied in differential type valves

2.2 Explain the concept of pressure and the various ways we use to develop pressure in a sprinkler system
- gravity
- compression of air or another gas
- centrifugal force
- pump impellers

2.3 Describe static and residual pressure, the concepts of flow rate and velocity, and the requirements for uncalculated systems

2.4 Identify the causes of pressure losses in sprinkler systems due to friction and how the extent of those losses is determined

2.5 Explain how to calculate requirements for coverage area and spray density for the various occupancy hazards.

2.6 Establish the volume of water that must be provided by the various automatic supplies in various occupancy classifications.
- pipe schedule method
- area/density method
- room design method

Number:	3
Title:	**Design Documentation**
Duration:	12 Total Hours Theory: 12 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5444.05, 5443.04, 5443.05	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to prepare working plans for approval to the authority having jurisdiction before any equipment is installed or remodeled according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Identify standard types of construction trade drawings and prints.

3.2 Create a working plan and elevation view drawings of a typical sprinkler system installation.
establish design criteria
- sprinkler head location
- distribution piping
- scaling and dimensioning
- symbols and abbreviations
- riser detail

3.3 Compile a list of materials.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
50%	25%	25%

Minimum Equipment List:

calculator
computer
drafting paper, pencils, erasers
flow charts
scale rules
software
T squares
30/60 triangles

Number:	S0432
Title:	**Installation of Pumps, Drivers and Controllers**
Duration:	72 Total Hours Theory: 72 Hours Practical: 0 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424, S0425, S0426, S0427, S0428, S0429, S0430
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Fire Pumps and Controllers	24	24	0
2	Secondary Water Supply	36	36	0
3	Fuel System Installation	6	6	0
4	Batteries, Supports and Shields	6	6	0
	Total Hours	**72**	**72**	**0**

Number:	1
Title:	**Fire Pumps and Controllers**
Duration:	24 Total Hours Theory: 24 Hours Practical: 0 Hours
Cross-Reference to Training Standard:	5450.01, 5450.02, 5450.03, 5450.04, 5450.06, 5450.08, 5450.11

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to describe the procedures for installing and maintaining fire pumps and controllers according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify types of pumps and describe their principles of operations and applications.
- types of drivers
- pump and pipe sizing
- capacity of pumps
- pressure ratings
- pump performance
- fire pump curve
- testing requirements
- start mechanisms
- pre-commissioning checks

1.2 Describe head pressure as it relates to pumps.

1.3 Describe installation procedures for fire, booster and jockey pumps.

1.4 Identify types of controllers and describe their application, installation, testing and maintenance.

1.5 Describe the effects of potential problems and their solutions.
- air leaks
- cavitations
- air pockets
- rotation
  - drivers
  - rpm
  - pressure relief valves

1.6 Describe code and manufacturers' requirements for maintenance and testing of fire pumps.

Number:	2
Title:	**Secondary Water Supply**
Duration:	36 Total Hours Theory: 36 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5444.02, 5446.03, 5446.04, 5446.09	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to describe the procedures for installing, testing, and maintaining various types of secondary water supply sources according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify limited water supply conditions.
- reservoirs
- pressure tanks
- gravity tanks
- municipal

2.2 Describe pressure and gravity tanks and their applications.
- locations
- tank sizes and pressure
- operation
- water supply requirements
- piping, valves, trim and accessories installation
- electrical requirements
- discharge and drainage pipe requirements

2.3 Identify basic guidelines for the care and maintenance of all types of water tanks.

2.4 Explain the procedures for inspecting and testing water storage tanks.
- heating system
- temperature limit switches
- high and low water level alarms
- pressure gauges

2.5 Verify the flushing and testing of the water supply pipe.
- contractor’s test and material certificates
- chlorinating certificates
- back-up flow analysis

Number:	3			
Title:	**Fuel System Installation**			
Duration:	6 Total Hours	Theory:	6 Hours	Practical: 0 Hours
Cross-Reference to Training Standard: 5450.07, 5450.09				

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to describe the procedures to select and install a fuel system according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Describe the procedures to select, coordinate and install a fuel and components.
- fuel source
- emission exhaust
- ventilation
- storage tanks
- exhaust piping

3.2 Describe the procedures for the installation of protection devices for fuel links to prevent impairment.

Number:	4
Title:	**Batteries, Battery Supports and Shields**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5450.10	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for batteries, battery supports and shields according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Install batteries, battery supports and shields.

4.2 Perform required maintenance on batteries, supports and shields.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	0%	25%

Minimum Equipment List:

adapter fittings
amp/volt meter
battery load tester
calibrating gauge
computer
differential pressure gauge
fire pump and controller
flow meter
hoses
Pitot tubes
play pipes
pressure gauge kit
RPM reader
stop watch
tachometer
temperature gauge
test hoses and securement
two-way radio
water supply source

Number:	S0433
Title:	**Detection and Actuation Devices**
Duration:	48 Total Hours Theory: 33 Hours Practical: 15 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424, S0425, S0426, S0427, S0428, S0429, S0430
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Fixed Temperature Detection and Actuation Devices	21	15	6
2	Rate of Rise and Combination Detection and Actuation Devices	21	15	6
3	Manual Activation Devices	6	3	3
	Total Hours	**48**	**33**	**15**

Number:	1
Title:	**Fixed Temperature Detection and Actuation Devices**
Duration:	21 Total Hours Theory: 15 Hours Practical: 6 Hours
Cross-Reference to Training Standard: 5451.01, 5451.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to install and determine the maintenance requirements for fixed temperature detection and actuation devices according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify and select fixed temperature detection and actuation devices.
- wet and dry pilot detector and actuators
- electric solenoids
- foam actuation devices
- protecto wire systems

1.2 Explain installation and maintenance procedures for fixed temperature detection and actuation devices.
- wet and dry pilot detector and actuators
- electric solenoids
- foam actuation devices
- protecto wire systems

Number:	2
Title:	**Rate of Rise and Combination Detection and Actuation Devices**
Duration:	21 Total Hours Theory: 15 Hours Practical: 6 Hours
Cross-Reference to Training Standard: 5451.02, 5451.04, 5451.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to install and determine the maintenance requirements for rate of rise and combination detection and actuation devices according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify and select rate of rise and combination detection and actuation devices.
- pneumatic
- electric
- hydraulic

2.2 Explain installation and maintenance procedures for rate of rise and combination detection and actuation devices.
- pneumatic
- electric
- hydraulic

Number:	3
Title:	**Manual Activation Devices**
Duration:	6 Total Hours Theory: 3 Hours Practical: 3 Hours
Cross-Reference to Training Standard: 5451.03, 5451.04	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to install and determine the maintenance requirements for manual activation devices according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Identify and select manual activation devices.

3.2 Explain installation and maintenance procedures for manual activation devices.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
45%	30%	25%

Minimum Equipment List:

air sampling devices
amp/volt meter
aspiration detection devices
boots
coveralls
ear plugs and ear muffs
protomatic test pump
face shield
fall arrest system
fire extinguisher
fixed temperature detection devices
gloves
goggles
heat lamp
hydrometer
manometer
manual pull stations
masks
rate of rise detection devices
reflector vest
respirator
safety glasses
self-contained breathing apparatus
smoke bomb
tag and lock-out devices
temperature gauge
testing pump

Number:	S0434
Title:	**Specific Application Fire Protection Systems**
Duration:	42 Total Hours Theory: 42 Hours Practical: 0 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424, S0425, S0426, S0427, S0428, S0429, S0430
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Dry and Wet Chemical Systems	6	6	0
2	Fixed Water Spray Systems	6	6	0
3	Water Mist Systems	6	6	0
4	Foam Extinguishing Systems	6	6	0
5	Carbon Dioxide Systems	6	6	0
6	Clean Agent Extinguishing Systems	6	6	0
7	Outside Exposure Systems	6	6	0
	Total Hours	**42**	**42**	**0**

Number:	1
Title:	**Dry and Wet Chemical Systems**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.03, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for dry and wet chemical systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Identify types of dry and wet chemical systems and describe their operating principles and applications.
- methods of dispensing dry and wet chemicals
- applications and action of expellant gas
- extinguishing properties
- handling and storage

1.2 Describe fixed pipe systems.
- total flooding
- local application

1.3 Describe common installation requirements of all dry and wet chemical systems.
- codes and regulations
- materials
- supports and hangers
- systems actuation
- testing
- servicing

Number:	2
Title:	**Fixed Water Spray Systems**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.09, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for fixed water spray systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Describe fixed water spray systems and their operating principles.
- applications
- codes and regulations
- water supply required
- design of system
- water spray nozzles characteristics and applications
- exposure protection

2.2 Describe installation requirements for fixed water spray systems.
- codes and regulations
- materials
- supports
- system actuation
- testing
- servicing
- manufacturers' specifications

2.3 Describe the system controls for the fixed water spray system and installation.

2.4 Explain the requirements for leak testing the system.

2.5 Explain the requirements for drainage of the system.

2.6 Describe service and maintenance procedures for a fixed water spray system.

Number:	3
Title:	**Water Mist Systems**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.11, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for water mist systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

3.1 Describe water mist systems and their operating principles.
- applications
- codes and regulations
- water supply required
- design of system
- characteristics and selection of water spray nozzles
- exposure protection

3.2 Describe installation requirements for water mist systems.
- codes and regulations
- materials
- supports
- system actuation
- testing
- servicing
- manufacturers' specifications

3.3 Describe the system controls for water mist system and installation.

3.4 Explain the requirements for leak testing the system.

3.5 Explain the requirements for drainage of the system.

3.6 Describe service and maintenance procedures for a fixed water spray system.

Number:	4
Title:	**Foam Extinguishing System**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.10, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for foam extinguishing systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

4.1 Describe foam extinguishing systems and their operating principles.
- applications
- codes and regulations
- water supply required
- design of system
- characteristics and selection of water spray nozzles
- exposure protection

4.2 Describe installation requirements for foam extinguishing systems.
- codes and regulations
- materials
- supports
- system actuation
- testing
- servicing
- manufacturers' specifications

4.3 Describe the system controls for water mist system and installation.

4.4 Describe the typical installation of foam extinguishing systems.
- foam liquid storage tank and trim
- reserve tank and trim
- foam liquid pump
- check valves, strainers and orifice plates
- deluge valves
- piping
- cross connection control valves
- discharge methods

4.5 Explain the operation of a balanced pressure proportioning system.

4.6 Explain the operation of a pressure proportioning tank with and without diaphragm.

4.7 Describe testing and maintenance procedures for foam extinguishing systems.

Number:	5
Title:	**Carbon Dioxide Systems**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.02, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for carbon dioxide systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

5.1 Describe carbon dioxide systems and its operating principles.
- applications
- codes and regulations
- design of system
- exposure protection
- local application or total flooding
- safety practices for handling, storing, testing, servicing

5.2 Describe the methods of system operations.
- total flooding
- local application
- hand directed operation
- actuation of each system
- detection of fires
- low and high pressure systems
- supervision of system
- working pressure
- alarms and indicators

5.3 Describe the requirements for carbon dioxide.
- amount of carbon dioxide
- storage requirements for carbon dioxide containers
- storage temperatures

5.4 Describe the requirements for the installation of the carbon dioxide system.

- codes and regulations
- piping requirements
- tools and materials
- discharge nozzles
- manufacturers' specifications

5.5 Identify the requirements for leak testing the carbon dioxide system.

5.6 Describe service, maintenance and removal procedures for carbon dioxide systems.

Number:	6
Title:	**Clean Agent Extinguishing Systems**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5440.01, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for clean agent extinguishing systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

6.1 Describe clean agent extinguishing systems and their operating principles.
- applications
- codes and regulations
- design of system
- exposure protection
- local application or total flooding
- safety practices for handling, storing, testing and servicing

6.2 Identify the components used in clean agent systems.
- quantity of agent
- storage container requirements
- distribution of extinguishing agents
- pipe and materials
- discharge nozzles
- pressure relief venting

6.3 Describe detection, activation, alarm and control systems for the clean agent extinguishing system.

6.4 Identify inspection, testing and maintenance requirements for the clean agent extinguishing system.

6.5 Describe possible safety hazards.

Number:	7
Title:	**Outside Exposure Systems**
Duration:	6 Total Hours Theory: 6 Hours Practical: 0 Hours
Cross-Reference to Training Standard: 5449.06, 5449.12	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to determine the installation and maintenance requirements for outside exposure systems according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

7.1 Describe outside exposure systems and their operating principles and applications.

7.2 Describe the installation requirements for outside exposure systems.
- codes and regulations
- water service requirements
- methods of actuation
- sprinkler heads
- strainers and trim

7.3 Describe the requirements of hydrostatic testing of the outside exposure system.

7.4 Describe the requirements for drainage of the outside exposure system.

7.5 Describe service and maintenance procedures for outside exposure systems.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	0%	25%

Minimum Equipment List:

specialty fittings
variable spray nozzles

Number:	S0435
Title:	**Communication and Documentation**
Duration:	30 Total Hours Theory: 15 Hours Practical: 15 Hours
Prerequisites:	Reportable Subjects S0421, S0422, S0423, S0424, S0425, S0426, S0427, S0428, S0429, S0430
Co-requisites:	None

Number	Topic	Hours Total	Hours Theory	Hours Practical
1	Communications	15	9	6
2	Trade Documents and Reports	15	6	9
	Total Hours	**30**	**15**	**15**

Number:	1
Title:	**Communications**
Duration:	15 Total Hours Theory: 9 Hours Practical: 6 Hours
Cross-Reference to Training Standard: 5441.01, 5441.04, 5441.05, 5453.03, 5450.06	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate ability to communicate using trade language in verbal and written format according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

1.1 Demonstrate communication skills.
- accept, give and respond to instructions
- interact with co-workers, supervisors, contractors, clients, etc.

1.2 Describe site communication requirements and their relevance to job application.
- site meetings
- scheduling
- work distribution
- safety meetings
- coordination of activities
- verbal and visual signals

1.3 Prepare work orders to schedule site services.

Number:	2
Title:	**Trade Documents and Reports**
Duration:	15 Total Hours Theory: 6 Hours Practical: 9 Hours
Cross-Reference to Training Standard: 5441.02, 5441.03	

General Learning Outcome:

Upon successful completion of the reportable subject, the apprentice is able to demonstrate ability to read trade documents and reports, record data and maintain documentation according to all applicable acts, codes, policies, procedures and standards.

Learning Outcomes and Content:

Upon successful completion the apprentice is able to:

2.1 Identify documents and reports used in the trade and describe their purpose.
- acts and regulations
- trade codes
- policies and procedures
- manufacturers' recommendations
- time sheets
- progress reports
- safety forms and reports
- test reports and certificates
- inspection reports
- property damage reports

2.2 Read and interpret trade documents identifying key information.

2.3 Create written or electronic reports and documents as required within the trade.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
25%	50%	25%

Minimum Equipment List:

calculator
computer
manuals
trade codes
trade documents

Level 3 – Summary of Minimum Recommended Equipment

adapter fittings
air sampling devices
amp/volt meter
aspiration detection devices
battery load tester
boots
calculator
calibrating gauge
computer coveralls
differential pressure gauge
drafting paper, pencils, erasers
ear plugs and ear muffs
protomatic test pump
face shield
fall arrest system
fire extinguisher
fire pump and controller
fixed temperature detection devices
gloves
goggles
flow charts
flow meter
heat lamp
hoses
hydrometer
manometer
manuals
masks
Pitot tubes
play pipes
pressure gauge kit
RPM reader
reflector vest
respirator
safety glasses
self-contained breathing apparatus
scale rules
software
specialty stop watch
specialty fittings
T squares
tachometer
tag and lock-out devices
temperature gauge
test hoses and securement
testing pump
trade codes
trade documents
two-way radio
30/60 triangles
variable spray nozzles
water supply source

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Sprinkler Fitter