



Skills for Employment Investment Program (SEIP)

COMPETENCY-BASED LEARNING MATERIAL (FACULTY GUIDE) FOR PLUMBING (CONSTRUCTION SECTOR)

**Finance Division, Ministry of Finance
Government of the People's Republic of Bangladesh**

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Approval Sheet

Identification and validation of modules and content for this occupation were made by experts within this sector. A series of consultations were held to accurately capture industry and employer needs and expectations and develop the learning material that would help to enhance the employability of the youth trained. This process started on 22 May 2017 and concluded with a validation workshop with a sectoral working group on 28 August 2017.

Experts Involved

Industry and subject-matter experts who provided their valuable inputs to develop this competency-based learning material [May 2017 - August 2017]:

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Validation Workshop

Competency-based learning material validation workshop participants [held on 28 August 2017]:

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Md. Nazrul Islam	Ruposhi Group	Assessor
Md. Monirul Islam	National Development Engineers	Assessor

How to Use this Competency-based Learning Material

Welcome to the competency-based learning material for Plumbing for use in construction works. These modules contain training materials and activities for learners to complete in order to become competent and qualified as a skilled worker.

There are seven (7) modules that make up this course which comprises the skills, knowledge and attitudes required to become a skilled worker including:

1. Perform pipe threading operation
2. Perform access cutting and encroachment works
3. Carry out water supply line installation using G.I, PPR/HDP pipes
4. Carry out water supply line installation using PVC/UPVC pipes
5. Carry out sewer pipe line installation
6. Carry out plumbing fixtures installation
7. Perform pressure testing of piping system

As a trainer, you are required to guide the learners through a series of activities in order to complete each learning outcome of the module. These activities may be completed as part of structured classroom activities or they may be required to work at their own pace.

These activities will require the learners to complete associated learning and practice activities in order to gain knowledge and skills they need to achieve the learning outcomes. Refer to **Learning Activity Page of each module** to know the sequence of learning tasks and the appropriate resources to use for each task.

This page will serve as the road map towards the achievement of competence. If you read the **Information Sheets**, these will give you an understanding of the work, and why things are done the way they are. Once the learners have finished reading the Information Sheets, they are required to complete the questions in the **Self-Check Sheets**.

The self-check process follows the Information Sheets in the learning guide. Completing self-checks will help the learners know how they are progressing. To know how they fared with self-checks, they can review the **Answer Key**.

The learners are required to complete all activities as directed in the **Job Sheet**. This is where they will apply their newly acquired knowledge while developing new skills. When working, high emphasis should be laid on safety requirements. The learners should be encouraged to raise relevant queries or ask the facilitator for assistance as required.

When the learners have completed all the tasks required in the learning guide, an assessment event will be scheduled to evaluate if they have achieved competency of the specified learning outcomes and are ready for the next task.

Introduction to Teaching Adult Learners

Since you will be dealing with adult learners, it is important to understand the basic principles of adult learning and methodologies. Adults learn best through associations, experiences and application. A few facts to consider while teaching adult learners:

Discussion: Adult learning is best managed through mutual dialogue and discussion. Discussion needs to be encouraged and used in the classroom to maximise learning.

Associations: Adults have experiences which can be related to any learning objectives to create associations which enhance conceptual comprehension. Associations can be used to create user interest and gain attention. Adults learn new attitudes or skills best in relation to previous life experiences.



This strategy also ensures knowledge retention.

Create an environment conducive to learning and sharing: Make people feel comfortable talking to you and each other. They should feel at ease asking questions, sharing views even if they are not very sure of the efficacy of their suggestions or views.

Physical surroundings: Temperature, light, space and furniture should be optimal. There should be no distractions.

Inculcate respect: Encourage learners' contributions and experiences. People are more encouraged to learn and share when their experiences are acknowledged - new information builds easily on past knowledge and experience.

Reward and recognition: Acknowledging the efforts of people, even small attempts, can reap great benefits. Learners like to receive praise and positive encouragement, which motivates them to deliver their best.

Learners also like to be reassured that they are correctly recalling or using information they have absorbed in the classroom.

Structured teaching: Learners study faster when information or skills are presented in a structured way:

- Concepts to be taught in small, bite sized portions for easy assimilation
- Put forth the easiest ideas or skills first and then gradually build on them
- Bring in the important ideas first
- Reinforce key ideas at regular intervals
- Reinforce high order concepts at regular intervals

Move learner from generic to specific flow of information: Introduce the generic concepts first and then move to specific more complex information to ease understanding and comprehension.

Application of concepts/ideas taught: Help students put into practice the concepts taught in the class through exercises and work-based projects. Application ensures knowledge retention and skill building.

Relevance building: Build up relevance of the concepts being taught in class by relating them to day-to-day life and workplace experiences.

Learners should know to use and apply what they have learned in the classroom as they learn faster when they recognise that what they are learning will be useful in the future.

Sharing: Encourage learners to learn from each other and solve problems collectively. This makes learning easier and improves team spirit and the interpersonal skills of the learners.

Participation: Involve learners in the class - adults favour to be *active participants* in learning rather than passive receivers of knowledge. People learn faster when they actively process information, solve problems and practice skills.

Motivate: Inspire the class so that teaching does not become a one-way process of knowledge download. Learners will learn faster when they feel an inner urge to learn and be an active participant in the class.

Create a learning environment in which the learners feel free and able to shed their inhibitions and develop receptivity towards new ideas and concepts.

Students will have different motivation levels - some will be more eager to learn than others as each learner is different from the other and therefore need to be treated differently.

And remember - adapt your communication style to suit the needs of the audience.

Communicate effectively: Communicate in a manner that is understood by the class. The language and sentence structuring should be clear and succinct.

Technical concepts should be explained in a manner that de-mystifies the concept - make things simple and easy to understand.

Avoid using *too much* technical jargon - if it is part of the curriculum, ensure the class is first made familiar with the words or jargon used.

Assessments: Conduct skill and knowledge checks regularly:














- Reinforce high order concepts at regular intervals.
- Conduct formative and summative assessments.
- Strengthen areas which appear to be weak.

Regular feedback:

- Provide regular feedback to learners
- Help them identify their strengths and areas of improvement
- Feedback should always be constructive
- Timely and specific feedback is easier to accept and act on



List of Icons

Icon Name	Icon
Module content	
Learning outcomes	
Performance criteria	
Contents	
Assessment criteria	
Resources required	
Information sheet	
Self-check Quiz	
Answer key	
Activity	
Video reference	
Learner job sheet	
Assessment plan	
Review of competency	

Module 1: Perform pipe threading operation

Module Descriptor:	This module covers the skills, knowledge and attitudes to perform pipe threading operation for plumbing works in construction which includes gathering and checking tools, equipment and materials, carrying out steel pipe cutting operation, carrying out thread cutting operation, assembling pipe run, and cleaning and maintaining the work area.	
Nominal Duration:	40 hours	
Learning Outcomes:	1.1.	Gather and check tools, equipment and
	1.2.	Carry out steel pipe cutting operation
	1.3.	Carry out thread cutting operation
	1.4.	Assemble pipe run
	1.5.	Clean/maintain the work area
Performance Criteria:	1.1.	Required pipe size and dimensions are identified in accordance to plumbing plan/design
	1.2.	Pipes are selected and gathered in accordance to specification
	1.3.	Personal protective equipment (PPE) is selected and used
	1.4.	Tools, equipment and materials are selected, gathered and checked for usability
	1.5.	Pipes are measured and marked in accordance to plumbing plan/drawing specification
	1.6.	Steel pipes are clamped and fixed using appropriate clamping device
	1.7.	Pipe run length is measured and cut using appropriate cutting tool
	1.8.	Pipes are cut in accordance with plumbing plan/drawing and the type of attachment fittings
	1.9.	Pipe run length is measured within the specified tolerance
	1.10.	Newly cut pipe is de burred/removed of burr using appropriate de burring tool
	1.11.	Diestocks are adjusted and initiated into the pipe end squarely
	1.12.	Thread cutting is carried out on pipes in accordance to workplace procedure
	1.13.	Coolant is used during thread cutting operation
	1.14.	Pipes are laid down in accordance with the planned/designed pipe run
	1.15.	Pipes and pipe fittings are assembled and fixed in accordance with planned/designed pipe run
	1.16.	Pipes, fittings and pipe runs are checked for damage/quality of work
	1.17.	Plumbing tools/equipment are cleaned and checked for operability
	1.18.	Work area is cleaned, and waste materials are disposed of in accordance with workplace requirements



Learning Outcome 1.1 - Gather and Check Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ Names of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask and ear plug ▪ List of main tools, equipment and materials uses 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.1.1	Information Sheet 1.1.1 Self-Check Quiz 1.1.1 Answer Key 1.1.1 https://www.youtube.com/watch?v=hZbp-s3LJYo	8 10 33
	1.1.2	Information Sheet 1.1.2 Self-Check Quiz 1.1.2 Answer Key 1.1.2 https://www.globalindustrial.com/c/plumbing/plumbing-tools https://www.plumbingsupply.com/tools.html	10 13 33
	1.1.3	Information Sheet 1.1.3 Self-Check Quiz 1.1.3 Answer Key 1.1.3	13 14 33
	1.1.4	Information Sheet 1.1.4 Self-Check Quiz 1.1.4 Answer Key 1.1.4	14 15 33
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Required pipe size and dimensions are identified in accordance to plumbing plan/design ▪ Pipes are selected and gathered in accordance to specification ▪ Appropriate personal protective equipment (PPE) is selected and used ▪ Necessary tools and equipment are selected, gathered and checked for usability 		



Learning Outcome 1.2 - Carryout Steel Pipe Cutting Operation

Contents:	<ul style="list-style-type: none"> ▪ Pipes and their uses: galvanized iron (GI) pipe, PVC pipe, stainless steel (SS) pipe, Boehringer Ingelheim (BI) pipe and cast iron (CI) pipe ▪ Fittings and their uses: elbow 90°, Elbow 45°, tee, coupling, nipple, plug, cap, socket etc ▪ Steel pipe cutting procedures 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape and plumbing plan/drawing ▪ Pipes: GI pipe, PVC pipe, stainless steel pipe, BI pipe and cast-iron pipe ▪ Fittings: elbow 90° & 45°, tee, coupling, nipple, plug, cap and socket etc 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.2.1	Information Sheet 1.2.1 Self-Check Quiz 1.2.1 Answer Key 1.2.1 https://en.wikipedia.org/wiki/Pipe_Cutting	17 18 33
	1.2.2	Information Sheet 1.2.2 Job Sheet 1 Self-Check Quiz 1.2.2 Answer Key 1.2.2	18 20 21 33
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Pipes are measured and marked in accordance to plumbing plan/drawing specification ▪ Steel pipe is clamped using appropriate clamping device ▪ Pipe run length is measured and cut using appropriate cutting tool ▪ Pipe length is measured and cut in accordance with plumbing plan/drawing and the type of attachment fittings ▪ Pipe run length is measured within the specified tolerance 		



Learning Outcome 1.3 – Carry Out Thread Cutting Operation

Contents:	<ul style="list-style-type: none"> ▪ De-burring tool uses: flat file, round file, half round file. pipe reamer and sandpaper ▪ Coolant: water, oil, air, synthetic, nitrogen ▪ Thread cutting procedure 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape and plumbing plan/drawing ▪ Pipes: GI pipe, PVC pipe, stainless steel pipe, BI pipe and cast-iron pipe ▪ Fittings: elbow 90° & 45°, tee, coupling, nipple, plug, cap and socket etc 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.3.1	Information Sheet 1.3.1 Job Sheet 2 https://en.wikipedia.org/wiki/Threading_(manufacturing) https://www.instructables.com/id/Thread-Cutting-Internal-and-External-on-a-	23 24
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Steel/metal pipes are clamped and fixed using pipe vice ▪ Newly cut pipe is de burred/removed of burr using appropriate de burring tool ▪ Diestocks are adjusted and initiated into the pipe end squarely ▪ Thread cutting is carried out on pipes in accordance to workplace procedure ▪ Coolant is used during thread cutting operation ▪ Threads are checked to conform with the specified form and measured in accordance with plan/drawing 		



Learning Outcome 1.4 - Assemble Pipe Run

Contents:	<ul style="list-style-type: none"> ▪ Plan and design of pipe run ▪ Assembling procedure ▪ Checking for damage/quality check of pipes, fittings and pipe run 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape and plumbing plan/drawing ▪ Pipes: GI pipe, PVC pipe, stainless steel pipe, BI pipe and cast-iron pipe ▪ Fittings: elbow 90° & 45°, tee, coupling, nipple, plug, cap and socket etc 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.4.1	Information Sheet 1.4.1 https://www.todayshomeowner.com/video/how-to-align-pvc-pipe-fitting-during- https://www.youtube.com/watch?v=fWiXTr-6N4I https://www.youtube.com/watch?v=eMQRX2yXIsE	27
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Pipes are laid down in accordance with the planned/designed pipe run ▪ Pipes and pipe fittings are assembled and fixed in accordance with planned/designed pipe run ▪ Pipes, fittings and pipe runs are checked for damage/quality of work ▪ Assembled pipe runs are measured/checked within tolerable dimensions/length in accordance with design/specification 		



Learning Outcome 1.5 - Clean and Maintain the Work Area

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 Self-Check Quiz 1.5.1 Answer Key 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29 32 33
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		

Module 2: Perform access cutting and encroachment works

Module Descriptor:	This module covers the skills, knowledge and attitudes to perform access cutting and encroachment works which includes interpreting drawings and plumbing plans, inspecting encroachment work area, gathering tools, equipment and materials, cutting and making access through walls and floors, and cleaning and maintaining the work area.	
Nominal Duration:	32 hours	
Learning Outcomes:	2.1.	Interpret drawings and plumbing plans
	2.2.	Inspect encroachment work area
	2.3.	Gather tools, equipment and materials
	2.4.	Cut and make access through walls and floors
	2.5.	Clean/maintain the work area
Performance Criteria:	2.1.	Building drawing/plumbing plan is collected and correctly interpreted
	2.2.	Work area/line of encroachment and the possible obstructions/limitations along the line of encroachment work are identified
	2.3.	Obstructions/limitations are planned out
	2.4.	Tools, equipment and materials are selected, gathered and checked for usability
	2.5.	Appropriate personal protective equipment (PPE) is selected, checked and used
	2.6.	Lay out for access/encroachment work is properly made
	2.7.	Wall and floor are cut to create pipe access/encroachment as per workplace requirements
	2.8.	Cutting walls and floors are made without causing damage to the wall or floor and adjacent installations
	2.9.	Used tools and equipment are cleaned and maintained
	2.10.	Work area is cleaned and waste materials are disposed in accordance with workplace requirements



Learning Outcome 2.1 - Interpret Drawings and Plumbing Plans

Contents:	<ul style="list-style-type: none"> ▪ Building drawing: detail plumbing plan, elevation and section ▪ Encroachment of floor, wall, ceiling, slab, beam and column 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, hacksaw, cold chisel, hammer ▪ Equipment: power hacksaw, electric drill machine ▪ Materials: soft stone (marker), marking pen, pencil, masking tape and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	2.1.1	Information Sheet 2.1.1 Self-Check Quiz 2.1.1 Answer Key 2.1.1 https://en.wikipedia.org/wiki/Plumbing_drawing	37 38 48
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Building drawing/plumbing plan is collected ▪ Building drawing/plumbing plans are interpreted ▪ Work area/line of encroachment is identified 		



Learning Outcome 2.2 - Inspect Encroachment Work Area

Contents:	<ul style="list-style-type: none"> ▪ Obstructions/limitations along the line of encroachment: built in appliance, cabinet, concrete column and beam, doors, widows and existing pipe run ▪ Possible solutions/remedies to overcome 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, cold chisel, claw hammer, mallet adjustable wrench, box set wrench, pipe wrench, pliers, hacksaw, spirit level ▪ Equipment: jack hammer, drill press, angle grinder, portable drill, oxy-acetylene cutting outfit and welding machine ▪ Materials: soft stone (marker), marking pen, pencil, welding rod, cement, sand, putty 		
Learning Activities:	Activity	Resource	Student Guide Page
	2.2.1	Information Sheet 2.2.1 http://www.donleyservice.com/media/articles/2018/03/how-plumbers-fix-tre	39
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Possible obstructions/limitations along the line of encroachment work are identified ▪ Possible solutions/remedies needed for identified ▪ Obstructions/limitations are planned out ▪ Tools, equipment and materials required to carry out encroachment work are identified 		



Learning Outcome 2.3 – Gather Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ List of main tools, equipment and materials uses ▪ Name of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, cold chisel, claw hammer, mallet adjustable wrench, box set wrench, pipe wrench, pliers, hacksaw, spirit level ▪ Equipment: jack hammer, drill press, angle grinder, portable drill, oxy-acetylene cutting outfit and welding machine ▪ Materials: soft stone (marker), marking pen, pencil, welding rod, cement, sand, putty, scaffold and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	2.3.1	Information Sheet 1.1.1	8
		Information Sheet 1.1.2	10
		Information Sheet 1.1.3	13
		Information Sheet 2.3.4	42
		Self-Check Quiz 2.3.1	44
	Answer Key 2.3.1	48	
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Necessary tools, equipment and materials are selected, gathered and checked for usability ▪ Appropriate personal protective equipment (PPE) is checked and used 		



Learning Outcome 2.4 - Cut and Make Access Through Walls and Floors

Contents:	<ul style="list-style-type: none"> ▪ Lay out for access/encroachment work ▪ Techniques of cutting walls and floors 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, hacksaw, cold chisel, hammer ▪ Equipment: power hacksaw, electric drill machine ▪ Materials: soft stone (marker), marking pen, pencil, masking tape and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	2.4.1	Information Sheet 2.4.1 https://www.bhg.com/home-improvement/plumbing/how-to-run-pipes-through	45
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Lay out for access/encroachment work is made ▪ Concrete wall and floor are cut to create pipe access/encroachment in accordance to plumbing plan/specification ▪ Cutting walls and floors are made without causing damage to the wall or floor and adjacent installations ▪ Appropriate tools and equipment are used 		



Learning Outcome 2.5 - Clean Tools, Equipment and Workplace

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		

Module 3: Carry out water supply line installation using G.I, PPR and HDP pipes

Module Descriptor:	This module covers the skills, knowledge and attitudes to carry out water supply line installation using G.I pipe, PPR and HDP pipes which includes gathering and inspecting tools, equipment and materials, performing pipe cutting operation, pipe threading operation, assembling pipe runs, and cleaning/maintaining the work area.	
Nominal Duration:	50 hours	
Learning Outcomes:	3.1.	Gather and inspect tools, equipment and materials
	3.2.	Perform pipe cutting operation
	3.3.	Perform pipe threading operation
	3.4.	Assemble pipe runs
	3.5.	Clean/maintain the work area
Performance Criteria:	3.1.	Personal protective equipment (PPE) is selected and used.
	3.2.	Tools, equipment and materials are gathered and checked for usability.
	3.3.	Pipes are identified and gathered in accordance with plumbing plan and specifications.
	3.4.	Pipes are measured and marked as per plan/drawing specification.
	3.5.	Pipes are clamped and fixed using appropriate clamping device.
	3.6.	Pipes are cut using appropriate cutting tool.
	3.7.	Pipes are cut within the specified dimension and considering specified tolerance.
	3.8.	Diestocks are adjusted and initiated into the pipe end squarely.
	3.9.	Thread cutting is carried out on pipes in accordance to workplace procedure.
	3.10.	Coolant is used during thread cutting operation.
	3.11.	Threads are checked to conform with the specified form and measurement in accordance with plan/drawing
	3.12.	Pipe runs is positioned on the corresponding areas as per plumbing plan.
	3.13.	Piping joints and fittings are tightened using appropriate tools and sealant.
	3.14.	Pipe clamps and fixtures along pipe runs are installed in accordance with plumbing plan.
	3.15.	Leaks and non-conformance to plumbing design/plans are checked and corrected.
	3.16.	Holes and openings are filled with cement plasters and finishing.
	3.17.	Plumbing tools/equipment is cleaned and maintained.
	3.18.	Work area is cleaned and waste materials are disposed of in accordance with workplace requirements.



Learning Outcome 3.1 - Gather and Inspect Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ Name of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug ▪ List of main tools, equipment and materials uses ▪ Different kinds of pipes with uses: galvanized iron (GI), polypropylene (PPR) and high-density polyethylene (HDP) pipe 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, sealant (plastic, rubber, synthetic) thread tape (Teflon), welding rod, masking tape ▪ Pipe: GI, PPR and HDP pipes (different diameter) ▪ Fittings: gate valve, check valve, globe valve and foot valve 		
Learning Activities:	Activity	Resource	Student Guide Page
	3.1.1	Information Sheet 1.1.1 Information Sheet 1.1.2 Information Sheet 1.1.3 Information Sheet 1.1.4 Information Sheet 3.1.5 Self-Check Quiz 3.1.1 Information Sheet 3.1.6 Self-Check Quiz 3.1.2 Answer Key	8 10 13 14 51 69 53 55 69
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE) is selected and used ▪ Tools, equipment and materials are gathered and checked for usability ▪ Pipes are identified and gathered in accordance with plumbing plan and specifications 		



Learning Outcome 3.2 - Perform Pipe Cutting Operation

Contents:	<ul style="list-style-type: none"> ▪ GI, PPR and HDP pipes and their uses ▪ Clamping device (pipe stand, bench vice (w/v blocks), vice grip, pipe chuck, threading machine chucks) ▪ Cutting tools ▪ Tolerance 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, sealant (plastic, rubber, synthetic) thread tape (Teflon), welding rod, masking tape ▪ Pipe: GI, PPR and HDP pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	3.2.1	Information Sheet 2.3.4 Information Sheet 3.2.2 Self-Check Quiz 3.2.1 Job Sheet 3 Answer Key 3.2.1 https://www.youtube.com/watch?v=RMvw5m1nNx4	42 57 58 60 69
Assessment Criteria:	<ul style="list-style-type: none"> ▪ G.I/PPR/HDP pipes are measured and marked as per plan/drawing specification ▪ G.I/PPR/HDP pipes are clamped using appropriate clamping device ▪ G.I/PPR/HDP pipes are cut using appropriate cutting tool ▪ G.I/PPR/HDP pipes are cut within the specified dimension and considering specified tolerance 		



Learning Outcome 3.3 - Perform Pipe Threading Operation

Contents:	<ul style="list-style-type: none"> ▪ GI, PPR and HDP pipes clamping procedure. ▪ Diestocks adjustment technique ▪ Thread cutting procedure ▪ Coolant: water, oil, air, synthetic, nitrogen ▪ Threads checking 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, sealant (plastic, rubber, synthetic) thread tape (Teflon), welding rod, masking tape ▪ Pipe: GI, PPR and HDP pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	3.3.1	Information Sheet 3.3.1 https://www.wikihow.com/Thread-Pipe	63
Assessment Criteria:	<ul style="list-style-type: none"> ▪ GI, PPR and HDP pipes are clamped and fixed using appropriate clamping device ▪ Diestocks are adjusted and initiated into the pipe end squarely ▪ Thread cutting is carried out on pipes in accordance to workplace procedure ▪ Coolant is used during thread cutting operation ▪ Threads are checked to conform with the specified form and measurement in accordance with plan/drawing 		



Learning Outcome 3.4 - Assemble Pipe Run

Contents:	<ul style="list-style-type: none"> ▪ Piping joints and fittings tightening: techniques and safety precautions ▪ Sealants: thread tape (Teflon), cement, seals (plastic, rubber, synthetic & silicone) ▪ Pipe clamps and fixtures: steel pipe hanger, plastic pipe hanger, pipe clamps (plastic, steel and rubber) and tapes ▪ Leak and non-conformance: leak, length (dimension), pipe size, pipe offset angles, obstacles and aesthetics/appearance ▪ Finishing: caulk, cement, paint, tiles/marble and grommet 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape, cement, sand and plumbing plan/drawing ▪ Pipe: GI, PPR and HDP pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	3.4.1	Information Sheet: 3.4.1 https://knowledge.autodesk.com/support/inventor-products/learn-explore/	66
Assessment Criteria:	<ul style="list-style-type: none"> ▪ G.I/PPR/HDP pipe run is positioned on the corresponding areas as per plumbing plan ▪ Piping joints and fittings are tightened using appropriate tools and sealant ▪ Pipe clamps and fixtures along pipe run is installed in accordance with plumbing plan ▪ Leaks and non-conformance to plumbing design/plans are checked and corrected ▪ Holes and openings are filled with cement plasters and finishing 		



Learning Outcome 3.5 - Clean and Maintain the Work Area

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		

Module 4: Carry out water supply line installation using PVC/UPVC pipes

Module Descriptor:	This module covers the skills, knowledge and attitudes to carry out water supply line installation using PVC/UPVC pipes which includes gathering and inspecting of tools, equipment and materials, performing PVC/UPVC pipe cutting operation, performing PVC/UPVC pipe run assembly, and cleaning/maintaining the work area.	
Nominal Duration:	44 hours	
Learning Outcomes:	4.1.	Gather and inspect tools, equipment and materials
	4.2.	Perform PVC/UPVC pipe cutting operation
	4.3.	Perform PVC/UPVC pipe run assembly
	4.4.	Clean/maintain the work area
Performance Criteria:	4.1.	Personal protective equipment (PPE) is selected and used.
	4.2.	Tools, equipment and materials are gathered and checked for usability.
	4.3.	PVC/UPVC pipes sizes and schedules are identified and gathered.
	4.4.	PVC/UPVC pipes are measured and marked as per plan/drawing specification.
	4.5.	PVC/UPVC pipes are clamped using appropriate clamping device.
	4.6.	PVC/UPVC pipes are cut using appropriate cutting tool.
	4.7.	PVC/UPVC pipes are cut within the specified dimension and considering specified tolerance.
	4.8.	PVC/UPVC pipe runs is positioned on the corresponding location as per plumbing plan.
	4.9.	PVC/UPVC piping joints and fittings are assembled using appropriate tools and sealant.
	4.10.	Pipe clamps and fixtures along pipe runs are installed in accordance with plumbing plan.
	4.11.	Leaks and non-conformance to plumbing design/plans are checked and corrected.
	4.12.	Holes and openings are filled with cement plasters and finishing.
	4.13.	Plumbing tools/equipment is cleaned and maintained.
	4.14.	Work area is cleaned and waste materials are disposed of in accordance with workplace requirements.



Learning Outcome 4.1 - Gather and Inspect Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ Names of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug ▪ List of main tools, equipment and materials uses ▪ Different sizes of PVC/UPVC pipes with uses 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, sealant (plastic, rubber, synthetic) thread tape (Teflon), welding rod, masking tape ▪ Pipe: PVC/UPVC pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	4.1.1	Information Sheet 1.1.1 Information Sheet 1.1.2 Information Sheet 1.1.3 Information Sheet 1.1.4 Information Sheet 4.1.5 Self-Check Quiz 4.1.1 Information Sheet 3.1.6 Answer Key https://www.plumbingsupply.com/tools.html https://www.homedepot.com/b/Plumbing-Plumbing-Tools/N-5yc1vZbqlq	8 10 13 14 72 74 54 86
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE) is selected and used ▪ Tools, equipment and materials are gathered and checked for usability ▪ PVC/UPVC pipes sizes and schedules are identified and gathered 		



Learning Outcome 4.2 - Perform PVC/UPVC Pipe Cutting Operation

Contents:	<ul style="list-style-type: none"> ▪ PVC/UPVC pipes and uses ▪ Clamping device ▪ Cutting tools ▪ Tolerance 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), masking tape and plumbing plan/drawing ▪ Pipe: PVC/UPVC pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	4.2.1	Information Sheet 2.3.4 Information Sheet 4.2.2 Self-Check Quiz 4.2.1 Job Sheet 4 Answer Key 4.2.1 https://www.youtube.com/watch?v=_D8wtNYeX40 https://www.instructables.com/id/Tips-on-Cutting-PVC-Pipe/	42 76 77 79 86
Assessment Criteria:	<ul style="list-style-type: none"> ▪ PVC/UPVC pipes are measured and marked as per plan/drawing specification ▪ PVC/UPVC pipes are clamped using appropriate clamping device ▪ PVC/UPVC pipes are cut using appropriate cutting tool ▪ PVC/UPVC pipes are cut within the specified dimension and considering specified tolerance 		



Learning Outcome 4.3 - Perform PVC/UPVC Pipe Run Assembly

Contents:	<ul style="list-style-type: none"> ▪ Piping joints and fittings tightening: techniques and safety precautions ▪ Sealants: thread tape (Teflon), cement, seals (plastic, rubber, synthetic & silicone) ▪ Pipe clamps and fixtures: steel pipe hanger, plastic pipe hanger, pipe clamps (plastic, steel and rubber) and tapes ▪ Leak and non-conformance: leak, length (dimension), pipe size, pipe offset angles, obstacles and aesthetics/appearance ▪ Finishing: caulk, cement, paint, tiles/marble and grommet 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), masking tape and plumbing plan/drawing ▪ Pipe: PVC/UPVC pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	2.3.1	Information Sheet 2.3.1 http://www.iitk.ac.in/ce/test/IS-codes/is.13593.1992.pdf	82
Assessment Criteria:	<ul style="list-style-type: none"> ▪ PVC/UPVC pipe runs is positioned on the corresponding location as per plumbing plan ▪ PVC/UPVC piping joints and fittings are assembled using appropriate tools and sealant ▪ Appropriate curing time for sealant is done to create strong bond ▪ Pipe clamps and fixtures along pipe runs are installed in accordance with plumbing plan ▪ Leaks and non-conformance to plumbing design/plans are checked and corrected ▪ Holes and openings are filled with cement plasters and finishing 		



Learning Outcome 4.4 - Clean and Maintain the Work Area

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained. ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		

Module 5: Carry out sewer pipeline installation

Module Descriptor:	This module covers the skills, knowledge and attitudes to carry out sewer pipe line installation which includes planning out for sewer pipe line installation, gathering tools, equipment and materials, carrying out trenching and bedding works, laying sewer pipe, finishing final pipe run, and cleaning and maintaining the work area.	
Nominal Duration:	28 hours	
Learning Outcomes:	5.1.	Plan out for sewer pipe line installation
	5.2.	Gather tools, equipment and materials
	5.3.	Carry out trenching and bedding works
	5.4.	Lay sewer pipe
	5.5.	Finish final pipe run
	5.6.	Clean/maintain the work area
Performance Criteria:	5.1.	Work activities are confirmed by making site visit/inspection.
	5.2.	Pipe run and elevation are identified in accordance with plumbing plans/specification.
	5.3.	Personal protective equipment (PPE) is selected and used.
	5.4.	Tools, equipment and materials are gathered and checked for usability.
	5.5.	Size of trench/excavation is made in accordance with workplace and plumbing plan requirement.
	5.6.	Grade/slope/pitch of trench is applied in accordance with workplace and plumbing plan requirement.
	5.7.	Bedding materials are laid in accordance to workplace and plumbing plan requirement.
	5.8.	Sewer pipes are laid on the trench in accordance with workplace and plumbing plan requirements.
	5.9.	Bell ended sewer pipes are laid by placing the bell end at the uphill side of the pipe run.
	5.10.	PVC sewer pipes are installed by using appropriate sealing/gluing materials.
	5.11.	Fittings are installed to complete the final run of the sewer pipe installation.
	5.12.	Final pipe run is checked for leaks and non-conformance to workplace and plumbing line requirements.
	5.13.	Covering materials are laid on top of the sewer pipe run in accordance with workplace and plumbing plan requirement.
	5.14.	Plumbing tools/equipment is cleaned and maintained.
	5.15.	Work area is cleaned and waste materials are disposed in accordance with workplace requirements.



Learning Outcome 5.1 - Plan Out for Sewer Pipeline Installation

Contents:	<ul style="list-style-type: none"> ▪ Work activities: area cleaning, traffic re-routing, trench/excavation, tools and equipment gathering, materials gathering and stacking, concreting works ▪ Pipe line slope/pitch 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine. ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape, cement, sand and plumbing plan/drawing. ▪ Pipe: sewer pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	5.1.1	Information Sheet 5.1.1 Self-Check Quiz 5.1.1 Answer Key https://www.piercecountywa.org/DocumentCenter/View/886/P02-Building	88 89 106
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Work activities are confirmed by making site visit/inspection ▪ Pipe run and elevation are identified in accordance with plumbing plans/specification ▪ Pipe line slope/pitch is determined in accordance with plumbing plans/specification and result of site visit 		



Learning Outcome 5.2 - Gather Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ Names of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plugs ▪ List of main tools, equipment and materials uses ▪ Sewer pipe sizes and uses 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape and plumbing plan/drawing ▪ Pipe: Sewer pipes (different diameter) 		
Learning Activities:	Activity	Resource	Student Guide Page
	5.2.1	Information Sheet 1.1.1 Information Sheet 1.1.2 Information Sheet 1.1.3 Information Sheet 5.2.4 Self-Check Quiz 5.2.1 Information Sheet 5.2.5 Answer Key 5.2.1 https://en.wikipedia.org/wiki/Scaffolding https://www.wikihow.com/Erect-Scaffolding	8 10 13 91 92 92 106
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Required tools, equipment and materials are identified in accordance with plumbing plan and result of site visit/inspection ▪ Sewer pipe sizes/schedules are identified and gathered ▪ Personal protective equipment (PPE) is selected and used Tools, equipment and materials are gathered and checked for usability 		



Learning Outcome 5.3 - Carry Out Trenching and Bedding Works

Contents:	<ul style="list-style-type: none"> ▪ Trench/excavation layout procedure ▪ Grade/slope of trench: methods of determining and applying ▪ Bedding materials: sand, gravel, concrete and bricks 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: Measuring tape (5m), steel rule, spirit level, shovel, spade, cold chisel, hammer, string lines, ▪ Equipment: trenching/digging equipment ▪ Materials: marking pen, pencil, marking powder, masking tape, bedding materials and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	5.3.1	Information Sheet 5.3.1 Self-Check Quiz 5.3.1 Answer Key 5.3.1 http://www.mbwaterservicesboard.ca/pubs/specs/022180-pipe-excavatio	95 97 106
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Trench/excavation area/line is laid out in accordance with plumbing plan and result of site visit. ▪ Size of trench/excavation is made in accordance with workplace and plumbing plan requirement. ▪ Grade/slope of trench is applied in accordance with workplace and plumbing plan requirement. ▪ Bedding material is laid in accordance to workplace and plumbing plan requirement 		



Learning Outcome 5.4 - Lay Sewer Pipe

Contents:	<ul style="list-style-type: none"> ▪ Sewer pipe laying procedure ▪ Bell ended sewer pipes ▪ PVC sewer pipes ▪ Alignment and pipe elevation ▪ Sealing/gluing materials: solvents, cement, sealant (plastic, rubber, synthetic silicone, PVC primer) 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, spirit level, shovel, spade, cold chisel, hammer, string lines, ▪ Equipment: trenching/digging equipment ▪ Materials: marking pen, pencil, marking powder, masking tape and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	5.4.1	Information Sheet 5.4.1 Self-Check Quiz 5.4.1 Information Sheet 5.4.2 Answer Key 5.4.1 https://www.ehow.com/how_5063577_lay-sewer-pipe.html	98 99 99 106
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Sewer pipes are laid on the trench in accordance with workplace and plumbing plan requirements ▪ Bell ended sewer pipes are laid by placing the bell end at the uphill side of the pipe run ▪ PVC sewer pipes are installed by using appropriate sealing/gluing materials ▪ Alignment and pipe elevation are checked in accordance to workplace and plumbing plan requirements 		



Learning Outcome 5.5 - Finish Final Pipe Run

Contents:	<ul style="list-style-type: none"> ▪ Leaks and non-conformance: leaks, pipe size, fitting size, pipe run slope/grade, pipe damage ▪ Covering materials: sand, gravel and concrete 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, spirit level, shovel, spade, cold chisel, hammer, string lines, ▪ Equipment: trenching/digging equipment ▪ Materials: marking pen, pencil, marking powder, masking tape, covering materials and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 5.5.1 Self-Check Quiz 5.5.1 Answer Key 5.5.1	102 104 106
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Fittings are installed to complete the final run of the sewer pipe installation ▪ Final pipe run is checked for leaks and non-conformance to workplace and plumbing line requirements ▪ Re-works or revision is made where necessary ▪ Covering materials are laid on top of the sewer pipe run in accordance with workplace and plumbing plan requirement 		



Learning Outcome 5.6 - Clean and Maintain the Work Area

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		

Module 6: Carry out plumbing fixtures installation

Module Descriptor:	This module covers the skills, knowledge and attitudes to carry out plumbing fixtures installation which includes preparing for plumbing fixture installation, gathering tools, equipment and materials, installing new toilet bowl (commode), installing other plumbing fixtures, and cleaning and maintaining the work area.	
Nominal Duration:	60 hours	
Learning Outcomes:	6.1.	Prepare for plumbing fixture installation
	6.2.	Gather tools, equipment and materials
	6.3.	Install a new toilet bowl (commode)
	6.4.	Install other plumbing fixtures
	6.5.	Clean/maintain the work area
Performance Criteria:	6.1.	Work activities are confirmed by making site visit/inspection to install plumbing fixtures as per plan and workplace requirements.
	6.2.	Personal protective equipment (PPE) is selected and used.
	6.3.	Tools, equipment and materials are gathered and checked for usability.
	6.4.	The new toilet bowl is placed on the flange aligning the bolt holes with the bolts of the flange and wax ring in its proper place.
	6.5.	Nuts with washers are tightened squarely without over tightening.
	6.6.	Additional sealing material is applied around the base of the bowl in accordance to workplace requirements.
	6.7.	The water tank is installed on the bowl in accordance with manufacturer's instruction.
	6.8.	Plumbing fixtures are installed in accordance with plumbing plan and following manufacturer's instruction/specification.
	6.9.	Check newly installed plumbing fixtures for leaks and non-conformance with workplace requirements.
	6.10.	Plumbing tools/equipment is cleaned and maintained.
	6.11.	Work area is cleaned and waste materials are disposed of in accordance with workplace requirements.



Learning Outcome 6.1 - Prepare for Plumbing Fixture Installation

Contents:	<ul style="list-style-type: none"> ▪ Work activities for installation/repair of toilet bowl (commode), shower, bath tub, wash basin, kitchen sink, urinals, water closet, bidets, drinking fountains, terminal valves/faucets ▪ Plumbing fixture: toilet bowl (commode), shower, bath tub, wash basin, kitchen sink, urinals, water closet, bidets, drinking fountains, terminal valves/faucets 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round), cold chisel, hammer ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape, cement, sand and plumbing plan/drawing ▪ Fixtures: toilet bowl (commode), shower, bath tub, wash basin, kitchen sink, urinals, water closet, bidets, drinking fountains, terminal valves/faucets 		
Learning Activities:	Activity	Resource	Student Guide Page
	6.1.1	Information Sheet 6.1.1 Information Sheet 6.1.2 Self-Check Quiz 6.1.1 Answer Key https://ptpneples.com/plumbing-fixture-installation-repair/ https://homeguides.sfgate.com/install-plumbing-new-home-56399.html	109 110 111 129
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Work activities are confirmed in accordance with plumbing plan and workplace requirements ▪ Work site is visited and prepared prior to installation works ▪ Plumbing fixture is determined, collected and checked for workability and quality 		



Learning Outcome 6.2 - Gather Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ Names of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask and ear plug ▪ List of main tools, equipment and materials uses 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pipe threading machine, power hacksaw, drill press, angle grinder, welding machine ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape and plumbing plan/drawing 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.1.1	Information Sheet 1.1.1 Information Sheet 1.1.2 Information Sheet 1.1.3 Information Sheet 1.1.4 https://www.youtube.com/watch?v=hZbp-s3LJYo https://www.globalindustrial.com/c/plumbing/plumbing-tools https://www.plumbingsupply.com/tools.html	8 13 13 14
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Required pipe size and dimensions are identified in accordance to plumbing plan/design ▪ Pipes are selected and gathered in accordance to specification ▪ Appropriate personal protective equipment (PPE) is selected and used ▪ Necessary tools and equipment are selected, gathered and checked for usability 		



Learning Outcome 6.3 - Install A New Toilet Bowl (Commode)

Contents:	<ul style="list-style-type: none"> ▪ Toilet bowl (commode) installation ▪ Accessories: wax ring, nuts & bolts, washers etc ▪ Water tank installation with necessary accessories ▪ Sealing materials: cement concrete, grommet (rubber & plastic), sealants (rubber, silicone, plastic and synthetic), wax seal 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round), cold chisel, hammer ▪ Equipment: pipe threading machine, power hacksaw, drill press ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape, cement, sand and plumbing plan/drawing ▪ Plumbing fixture: toilet bowl (commode), water tank and manufacturer's instruction/specification/manual 		
Learning Activities:	Activity	Resource	Student Guide Page
	6.3.1	Information Sheet 6.3.1 Job Sheet 5 https://www.youtube.com/watch?v=wM-6bgV7G5s https://www.wikihow.com/Install-a-Toilet	114 117
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Toilet bowl flange is installed securely making sure the bolts are in place ▪ A new wax ring is placed at the bottom of the toilet bowl accurately ▪ The new toilet bowl is placed on the flange aligning the bolt holes with the bolts of the flange and wax ring in its proper place ▪ Nuts with washers are tightened squarely without over tightening ▪ Apply additional sealing material around the base of the bowl in accordance to workplace requirements ▪ The water tank is installed on the bowl in accordance with manufacturer's instruction 		



Learning Outcome 6.4 - Install Other Plumbing Fixtures

Contents:	<ul style="list-style-type: none"> ▪ Wash hand basin ▪ Shower ▪ Bath tub ▪ Kitchen sink ▪ Urinals ▪ Water closet ▪ Bidets ▪ Drinking fountains ▪ Terminal valves/faucets ▪ Leaks and non-conformance: leaks, damaged fixtures, broken/damaged fittings, wrong pipe size, wrong fitting size, damage flooring/walls 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round), cold chisel, hammer ▪ Equipment: pipe threading machine, power hacksaw, drill press ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), welding rod, masking tape, cement, sand and plumbing plan/drawing ▪ Plumbing fixture: shower, bath tub, wash basin, kitchen sink, urinals, water closet, bidets, drinking fountains, terminal valves/faucets 		
Learning Activities:	Activity	Resource	Student Guide Page
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing fixtures are installed in accordance with plumbing plan and following manufacturer's instruction/specification ▪ Check newly installed plumbing fixtures for leaks and non-conformance with workplace requirements ▪ Reworks/adjustment is carried out in accordance with workplace requirements 		
6.4.1	Information Sheet 6.4.1 Job Sheet 6 Self-Check Quiz 6.4.1 Answer Key https://www.youtube.com/watch?v=a_8-zz8tc7U		120 125 126 129



Learning Outcome 6.5 - Clean and Maintain the Work Area

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		

Module 7: Perform pressure testing of piping system

Module Descriptor:	This module covers the skills, knowledge and attitudes to perform pressure testing of piping system which includes preparing for pressure testing, gathering tools, equipment and materials, carrying out pressure testing, and cleaning and maintaining the work area.	
Nominal Duration:	24 hours	
Learning Outcomes:	7.1.	Prepare for pressure testing
	7.2.	Gather tools, equipment and materials
	7.3.	Carry out pressure testing
	7.4.	Clean/maintain the work area
Performance Criteria:	7.1.	Work activities are identified in accordance with plumbing plan and workplace requirements.
	7.2.	Maximum test pressure is determined in accordance with plumbing plan/design specification.
	7.3.	Pressure testing method is identified in accordance with plumbing plan/workplace requirements.
	7.4.	Piping system connections are reviewed and checked for tightness/integrity.
	7.5.	Devices, fixture or components in the piping systems that needs to be isolated is shut off to avoid damage.
	7.6.	Required tools, equipment and materials are identified in accordance with plumbing plan and workplace procedure on pressure testing.
	7.7.	Pressure testing tools, equipment and materials are collected and checked for usability/accuracy.
	7.8.	Personal protective equipment (PPE) is gathered and strictly used.
	7.9.	Preliminary, intermediate and final test pressures are applied progressively into the system in accordance with workplace pressure testing plan/procedure.
	7.10.	Appropriate Leak testing method is applied for each applied pressure to determine presence of leaks.
	7.11.	Leak testing result is reported to the concern person.
	7.12.	Test results are recorded in accordance with workplace requirements.
	7.13.	Safety precaution is observed when performing pressure testing.
	7.14.	Plumbing tools/equipment is cleaned and maintained.
	7.15.	Work area is cleaned and waste materials are disposed of in accordance with workplace requirements.



Learning Outcome 7.1 - Prepare for Pressure Testing

Contents:	<ul style="list-style-type: none"> ▪ Work activities for pressure testing: checking tightness of valves/fittings, measuring pipe runs, identifying of pipe run for pressure testing, identifying of fittings to be isolated and isolating system components ▪ Pressure testing method: pneumatic testing and hydrostatic testing 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round), cold chisel, hammer ▪ Equipment: air compressor, water pump, nitrogen pump/tank, pressure gauge and quick connect couplers/adapters ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon) and masking tape 		
Learning Activities:	Activity	Resource	Student Guide Page
	7.1.1	Information Sheet 7.1.1 Self-Check Quiz Answer Key https://www.youtube.com/watch?v=9lqF9sRt_FM https://www.hunker.com/12218547/how-to-pressure-test-plumbing	132 133 141
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Work activities are identified in accordance with plumbing plan and workplace requirements ▪ Maximum test pressure is determined in accordance with plumbing plan/design specification ▪ Pressure testing method is identified in accordance with plumbing plan/workplace requirements ▪ Piping system connections are reviewed and checked for tightness/integrity ▪ Devices, fixture or components in the piping systems that needs to be isolated is shut off to avoid damage 		



Learning Outcome 7.2- Gather Tools, Equipment and Materials

Contents:	<ul style="list-style-type: none"> ▪ Names of personal protective equipment (PPE) and their uses: safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plugs ▪ List of main tools, equipment and materials uses ▪ Pressure testing tools, equipment and materials 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), adjustable wrench, box wrench set, pipe wrench, mechanical pliers, screw driver (star, flat, positive) ▪ Equipment: pressure gauge, quick connects couplers/adapters, air compressor, water pump and nitrogen pump/tank ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon), masking tape 		
Learning Activities:	Activity	Resource	Student Guide Page
	7.2.1	Information Sheet 1.1.1 Information Sheet 1.1.2 Information Sheet 7.2.3 Self-Check Quiz 7.2.1 Information Sheet 2.3.4 Answer Key 7.2.1	8 10 135 136 42 141
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Required tools, equipment and materials are identified in accordance with plumbing plan and workplace procedure on pressure testing ▪ Pressure testing tools, equipment and materials are collected and checked for usability/accuracy ▪ Personal protective equipment (PPE) is gathered and strictly used 		



Learning Outcome 7.3 - Carryout Pressure Testing

Contents:	<ul style="list-style-type: none"> ▪ Pressure testing method/procedure ▪ Leak testing method: soap solution, leak testing instrument ▪ Safety precaution 		
Resources Required:	<ul style="list-style-type: none"> ▪ Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Tools: measuring tape (5m), steel rule, callipers, adjustable wrench, box wrench set, pipe wrench, combination pliers, die stock, pipe cutter, pipe vice, hacksaw, screw driver (star, flat, positive), spirit level, pipe reamer, files (flat, half round, round) ▪ Equipment: pressure testing tools, equipment and materials ▪ Materials: coolant (water based), soft stone (marker), marking pen, pencil, solvent, thread tape (Teflon) and masking tape 		
Learning Activities:	Activity	Resource	Student Guide Page
	7.3.1	Information Sheet 7.3.1 Self-Check Quiz 7.3.1 Answer Key 7.3.1 https://copperplumbing.org.uk/sites/default/files/content_attachments/pre	137 139 141
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Preliminary, intermediate and final test pressures are applied progressively into the system in accordance with workplace pressure testing plan/procedure ▪ Appropriate Leak testing method is applied for each applied pressure to determine presence of leaks ▪ Leak testing result is reported to the concern person ▪ Test results are recorded in accordance with workplace requirements ▪ Safety precaution is observed when performing pressure testing 		



Learning Outcome 7.4 - Clean and Maintain the Work Area

Contents:	<ul style="list-style-type: none"> ▪ Importance and necessity of cleaning tools and equipment and workplace ▪ Methods of cleaning, tools and equipment required for cleaning ▪ Lubricants ▪ Advantages of proper storing of tools and equipment; types of storage 		
Resources Required:	<ul style="list-style-type: none"> • Personal protective equipment (PPE): safety helmet, safety shoes, hand gloves, safety glasses, safety belt, apron, dust mask, ear plug/guard ▪ Cleaning tools and equipment: dusters, dust pans, mops, polishing clothes, brooms, brushes, buckets, dust bins and cotton rags ▪ Materials: water, detergents, abrasives, bleaches and lubricants (oil, grease and powder) 		
Learning Activities:	Activity	Resource	Student Guide Page
	1.5.1	Information Sheet 1.5.1 https://www.wikihow.life/Clean-a-House https://www.goodhousekeeping.com/home/cleaning/g2550/best-cleaning-	29
Assessment Criteria:	<ul style="list-style-type: none"> ▪ Plumbing tools and equipment are cleaned and maintained ▪ Work area is cleaned ▪ Waste materials are disposed of in accordance with workplace requirements 		