National Occupational Skill Standard
(NOSS)

Occupational Title : **Plumber**

Level : **2**

Sector : **Construction**

Sub - Sector : **Sanitary Service**

NOSS ID/NSCO ID :

ISCO NO :

Council for Technical Education and Vocational Training

NATIONAL SKILL TESTING BOARD

Madhyapur Thimi-17, Sanothimi, Bhaktapur, Nepal

Revised: 23-02-2021 (11-11-2077)

2045

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Recommended by Construction Technical Sub Committee: 2014 August

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Recommended by Construction Technical Sub Committee: 2019-03-27 (2075 Chaitra 13)

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Recommended by Construction Technical Sub Committee: 23 February 2021 (11 Falgun 2077)

1	**Occupational Title: Plumber** **Level: 2**
2	**Job Description:** Plumber L-2, installs household water supply and drainage system and installs public water supply pipelines.
	UNITS OF COMPETENCY: 1. Install household water supply and drainage system. 2. Install public water supply pipelines. 3. Perform communication. 4. Develop professionalism. ***Note: Units 3 and 4 are not for testing purpose.***
4	**Qualifying Notes/Prerequisites:** • Physical Requirements: Sound health • Entry Requirements: As per NSTB rules. **Additional Information:** • Assessment Types: Performance and Written test • Assessment Duration: 8 to 9 Hours (Single Competency) 8 to 10 hours (All Competency) • Recommended Group Size: 7 to 8 candidates

5	**Unit No: 1** **Unit Title: Install household water supply and drainage system.**	**Unit code:**

Elements of competency	Performance standards
1.1 Prepare tools, equipment and materials	1.1.1 ***Personal protective equipment (PPE)*** used in accordance with task requirement. 1.1.2 Tools and equipment collected and checked for working condition in accordance with task requirement. 1.1.3 Materials collected and prepared in accordance with task requirements.
1.2 Prepare estimate	1.2.1 Quantity of work determined as per drawing and site condition and recorded. 1.2.2 Working hour estimated based on quantity and nature of work. 1.2.3 Cost of labour and materials determined based on quantity and nature of work.
1.3 Prepare pipes and surface for laying	1.3.1 Scaffold firmly erected and fixed at correct location to withstand load of materials as well as two persons. 1.3.2 Size of ***pipes*** selected as per drawing and clearly marked to dimension. 1.3.3 Pipes straightly cut along with marked line. 1.3.4 Thread prepared on GI pipe to ***standard thread length*** without damage. 1.3.5 Anti-rust paint uniformly applied on GI pipes. 1.3.6 ***Pipe jointing*** performed as per task requirement. 1.3.7 Wall and floor clearly marked for openings as per drawing. 1.3.8 Wall and floor cut along the marked line with ***required tolerance*** in plumb and level. 1.3.9 Building drain excavated to the required size as per drawings.
1.4 Install pipes, sanitary fittings and fixtures	1.4.1 Hot and cold pipes separately laid along with cut portion within plumb and level. 1.4.2 Pipes and ***pipe fittings*** joined to the specified dimension within tolerance $\pm$ 2 mm in center-to-center dimension. 1.4.3 ***Valve*** installed and aligned without surface damage.

		1.4.4 Pipes aligned and clamped on wall and floor. 1.4.5 Hot water pipe covered with insulating materials. 1.4.6 ***Sanitary fittings and fixtures*** assembled, installed and connected as per diagram in line and level without leakage and damage. 1.4.7 Installation of pipes, sanitary fittings and fixtures inspected for ***common defects*** and rectified.
	1.5 Install waste and soil water system	1.5.1 Pipes and pipe fittings laid along building drain maintaining slope up-to 3% of pipe length. 1.5.2 Pipes joined without leakage and damage. 1.5.3 Water leakage checked and rectified. 1.5.4 Building drain filled with compaction at specified layer and surface levelled. 1.5.5 Building drainage pipe lines connected to ***building drain***.
	1.6 Install roof tank	1.6.1 Roof tank placed in designated location within level. 1.6.2 Outlet hole drilled 50-60mm above tank base to center of outlet. 1.6.3 Inlet hole drilled as per pipe diameter below 50-60mm from top of tank 1.6.4 Inlet and outlet pipe joined without leakage. 1.6.5 Pipe fittings and valve installed on inlet, outlet and overflow pipe. 1.6.6 Overflow pipe installed below 50-60mm from inlet. 1.6.7 Air vent pipe joined on outlet water stack vertically extended above top level of water tank. 1.6.8 Washout installed at the bottom of water tank.
	1.7 Install water pump	1.7.1 Working condition of water pump checked and placed in designated location within level. 1.7.2 Suction pipe equal to pump inlet diameter installed 50-60mm above base of water tank

		maintaining shortest distance without leakage. 1.7.3 Delivery pipe equal to pump outlet diameter installed and connected with roof tank supply pipe without leakage. 1.7.4 Water pump tested for functioning.
	1.8 Clean work area	1.8.1 Tools and equipment cleaned, maintained, stored and record maintained. 1.8.2 Work area cleaned and waste disposed in accordance with ***3R's principle.***
6	**Task Performance Requirements (Tools, Equipment and Materials):** • Measuring tape, pen, paper, pencil, sharpener, eraser, calculator, register, ruler, chalk, marker, scissors, try square, water level, spirit level, plumb bob, mason square, mason string, mason pan, clamp, scaffolding materials, rope, saddle, hammer, shovel, pick, wall cutter, bucket, basket, brush, broom, dust pan, bench vice, chain/pipe vice, hack saw, wooden saw, angle cutting saw, pipe cutter, files, pipe reamer, oil can, knife, pipe wrench, adjustable wrench, chamfering tools, HDPE heating plate, Teflon cloth, thermochrome chalk, thread seal tape, hemp/jute, PPR heating machine, solvent cement, CPVC glue, silicon, chisel, screw drivers, pliers, allen key, threading tool, anti-corrosion coating, pipe bender, mortar board, mason trowel, mason hammer, claw hammer, stock and die, electro fusion machine, wheelbarrow, pressure test pump, portable power/hand drill machine, pipes, valve, fittings, fixtures, water tank, water pump, water meter, cloth, putty, brick, cement, sand, aggregates, nails, screw, grip, step ladder and Personal protective equipment (PPE).	

7	**Safety and Hygiene (Occupational Health and Safety):** • Use personal protective equipment. • Safe handling of materials, tools and equipment. • Hazards involved in lifting tools, equipment and materials. • Safe handling of debris. • Hazards involved in handling cement. • Hazards involved in sharp objects. • Hazards involved due to short circuit and electricity. • Hazards involved due to slippery floors.

8	Required Knowledge		
	Technical Knowledge	**Applied Calculation**	**Graphical Information**

	• Tools and equipment
	  ○ Types
	  ○ Uses
	  ○ Safe handling
	• Introduction of plumbing
	• Basic plumbing terminology
	• Introduction of sanitary appliances, apparatus, fitting and fixtures.
	• Pipe
	  ○ Introduction
	  ○ Types
	  ○ Color code and pressure strength
	  ○ Uses
	  ○ Quality/standard
	  ○ Size and length
	  ○ Inner and outer diameter
	  ○ Insertion length
	  ○ Symbol
	  ○ Pipe fittings
	  ○ Pipe jointing and fabrication
	  ○ Pipe joining methods and techniques
	  ○ Tolerance level
	• Units of measurement
	• Marking and layout technique
		• Perform four basic fundamental operations
		• Convert metric unit to imperial and vice versa.
		• Calculate pipe length
			• Read and interpret plumbing and sanitary drawing.
			• Read and interpret instruction guide/manual.

	• Estimation of plumbing works
	• Plumbing drawing
	  ○ Introduction
	  ○ Signs and symbols
	  ○ Isometric drawing
	• Threading:
	  ○ Application
	  ○ Depth and length
	  ○ lubricant
	• Types and uses of valves
	• Hot and cold-water system
	  ○ Electrical and gas geyser
	  ○ Types of insulation
	• Sealing and filling materials
	• Types of water supply pipes
	• Water storage tank
	  ○ Introduction
	  ○ Types
	  ○ Capacity
	  ○ Uses
	• Water pump
	  ○ Introduction
	  ○ Types
	  ○ Capacity
	  ○ Uses
	  ○ Connection of suction and delivery pipe
	  ○ Testing		

	• Drainage system
	  ○ Introduction
	  ○ Types
	  ○ Uses
	  ○ Slope/gradient
	• Introduction of manhole, septic tank and soak pit
	• Leakage test
	  ○ Water test
	  ○ Air test
	  ○ Smoke test
	• Uses of water meter
	• Cement mortar
	• Waste management
	• Occupational health and safety rules and regulation
	• Use and importance of first aid kit		

9	Assessment of Competency					
	Unit: 1 **Unit Title: Install household water supply and drainage system**					
	Candidate Details			**Assessors Detail**		
	Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:			Assessors' Name 1. 2. 3.		ID/License No:
Element of competency	**Performance Standards**		**Standard Met**	**Standard Not Met**	**Evidence Type**	**Comments**
1.1 Prepare tools, equipment and materials	1.1.1 ***Personal protective equipment (PPE)*** used in accordance with task requirement. 1.1.2 Tools and equipment collected and checked for working condition in accordance with task requirement. 1.1.3 Materials collected and prepared in accordance with task requirements.					
1.2 Prepare estimate	1.2.1 Quantity of work determined as per drawing and site condition and recorded. 1.2.2 Working hour estimated based on quantity and nature of work. 1.2.3 Cost of labour and materials determined based on quantity and nature of work.					
1.3 Prepare pipes and	1.3.1 Scaffold firmly erected and fixed at correct location to					

surface for laying	withstand load of materials as well as two persons. 1.3.2 Size of ***pipes*** selected as per drawing and clearly marked to dimension. 1.3.3 Pipes straightly cut along with marked line. 1.3.4 Thread prepared on GI pipe to ***standard thread length*** without damage. 1.3.5 Anti-rust paint uniformly applied on GI pipes. 1.3.6 ***Pipe jointing*** performed as per task requirement. 1.3.7 Wall and floor clearly marked for openings as per drawing. 1.3.8 Wall and floor cut along the marked line with ***required tolerance*** in plumb and level. 1.3.9 Building drain excavated to the required size as per drawings.				
1.4 Install pipes, sanitary fittings and fixtures	1.4.1 Hot and cold pipes separately laid along with cut portion within plumb and level. 1.4.2 Pipes and ***pipe fittings*** joined to the specified dimension within tolerance $\pm$ 2 mm in center-to-center dimension. 1.4.3 ***Valve*** installed and aligned without surface damage. 1.4.4 Pipes aligned and clamped on wall and floor. 1.4.5 Hot water pipe covered with insulating materials. 1.4.6 ***Sanitary fittings and fixtures*** assembled, installed and connected as per diagram in line and level without leakage and damage. 1.4.7 Installation of pipes, sanitary fittings and fixtures inspected				

	for ***common defects*** and rectified.				
1.5 Install waste and soil water system	1.5.1 Pipes and pipe fittings laid along building drain maintaining slope up-to 3% of pipe length. 1.5.2 Pipes joined without leakage and damage. 1.5.3 Water leakage checked and rectified. 1.5.4 Building drain filled with compaction at specified layer and surface levelled. 1.5.5 Building drainage pipe lines connected to ***building drain***.				
1.6 Install roof tank	1.6.1 Roof tank placed in designated location within level. 1.6.2 Outlet hole drilled 50-60mm above tank base to center of outlet. 1.6.3 Inlet hole drilled as per pipe diameter below 50-60mm from top of tank 1.6.4 Inlet and outlet pipe joined without leakage. 1.6.5 Pipe fittings and valve installed on inlet, outlet and overflow pipe. 1.6.6 Overflow pipe installed below 50-60mm from inlet. 1.6.7 Air vent pipe joined on outlet water stack vertically extended above top level of water tank. 1.6.8 Washout installed at the bottom of water tank.				
1.7 Install water pump	1.7.1 Working condition of water pump checked and placed in designated location within level. 1.7.2 Suction pipe equal to pump inlet diameter installed 50-60mm above base of water tank maintaining shortest				

	distance without leakage. 1.7.3 Delivery pipe equal to pump outlet diameter installed and connected with roof tank supply pipe without leakage. 1.7.4 Delivery pipe connected to supply pipe of roof tank without leakage. 1.7.5 Water pump tested for functioning.				
1.8 Clean work area	1.8.1 Tools and equipment cleaned, maintained, stored and record maintained. 1.8.2 Work area cleaned and waste disposed in accordance with ***3R's principle.***				

WT- Written Test **OQ**- Oral Question **PT-** Practical Test **DO** – Direct Observation **SR**- Supervisor's report **SN**–Simulation

RP- Role Play **PG –**Photographs **VD**- Video **CT** – Certificates **TS** – Testimonials (Reward) **PP** – Product Produced

CS – Case Study

Range Statement

Variable	Range
Personal Protective Equipment	*May include but not limited to:* • Helmet • Apron/Safety Jacket • Goggles • Gloves • Protective shoes • Mask • Safety belt • Ear plug
Pipes	*May include but not limited to:* • High Density Polyethylene (HDPE) pipe • Galvanised Iron (GI) pipe • Polypropylene Random (PPR) pipe • Polyvinyl Chloride (PVC) pipe • Chlorinated Polyvinyl Chloride (cPVC) pipe • Un-plasticized Polyvinyl Chloride (uPVC) pipe • Multi-layer composite pipe
Standard thread length	*May include but not limited to:* **Diameter of Pipe (Inch)** — **Thread Length (mm)** • ½ — 13 • ¾ — 15

	• 1 17 • 1 ¼ 19 • 1 ½ 19 • 2 24
Pipe jointing	*May include but not limited to:* • Butt joint • Chemical joint • Screw/Threading joint • Electro fusion joint • Fusion joint • Adhesive joint • Solvent cement joint
Required tolerance	*May include but not limited to:* • Pan, Urinal shower, commode= 65mm center of pipe from finish tile • Basin =45 mm center of pipe from finish tile • Others: + 10 mm in diameter of pipe fittings
Pipe fittings	*May include but not limited to:* • Elbow • Union • Reducer • Tee • Nipple • Tank nipple • Trap • Cross

	• Offset • Socket
Valve	*May include but not limited to:* • Gate valve • Glove valve • Conceal valve • Float valve • Angle valve • Check valve • Foot valve • Ball valve
Sanitary fittings and fixtures	*May include but not limited to:* • Shower • Tap • Faucet • Wash basin • Water closet • Pan • Bidet • Bathtub • Sink • Flushing cistern • Gas/electrical geyser • Valve and clamps • Traps

	• Sanitary accessories: soap case, brush holder, shelf, towel rod/ring, toilet paper holder, looking mirror, commode spray
Common defects	*May include but not limited to:* • Leakage • Misalignment • Backflow • Physical damage
Building drain	*May include but not limited to:* • Manhole • Septic tank • Soak pit
3R's Principle	*May include but not limited to:* • Reduce • Reuse • Recycle

5	**Unit No: 2** **Unit Title: Install public water pipelines.**	**Unit code:**

Elements of competency	Performance standards
2.1 Prepare tools, equipment and materials	2.1.1 ***Personal protective equipment (PPE)*** used in accordance with task requirement. 2.1.2 Tools and equipment collected and checked for working condition in accordance with task requirement. 2.1.3 Materials collected and prepared in accordance with task requirements.
2.2 Prepare estimate	2.2.1 Worksite visited and ***required information*** collected. 2.2.2 Quantity of work determined and recorded. 2.2.3 Working hour estimated based on quantity and nature of work. 2.2.4 Cost of labour and materials determined based on quantity and nature of work.
2.3 Prepare pipes	2.3.1 Size of ***pipes*** selected as per drawing and clearly marked to dimension. 2.3.2 Pipes straightly cut along with marked line. 2.3.3 Thread prepared on GI pipe to ***standard thread length*** without damage. 2.3.4 Anti-rust paint uniformly applied on GI pipes. 2.3.5 ***Pipe jointing*** performed as per task requirement.
2.4 Install pipe fittings	2.4.1 Pipe, ***pipe fittings*** and gasket checked for damage. 2.4.2 Insertion portion marked on pipe edge. 2.4.3 Lubricants evenly applied on gasket and pipe. 2.4.4 Gasket placed into CI/DI hub and checked for fitting defects. 2.4.5 Pipe inserted up to marking line into hub. 2.4.6 Pipe and pipe fittings joined without surface damage. 2.4.7 Seam formed as per HDPE pipe wall thickness with seam tolerance of +2 mm on joint part. 2.4.8 Leakage checked.

	2.5 Lay pipes	2.5.1 Trench and bedding size checked as per drawing and maintained. 2.5.2 Pipe and fittings cleaned and checked for damage. 2.5.3 Pipes laid on trench within level for distribution line. 2.5.4 Pipes joined to the specified dimension within tolerance ± 5 mm in center-to-center dimension without leakage. 2.5.5 Installation of pipes inspected for ***common defects*** and rectified.
	2.6 Install water meter	2.6.1 Physical condition of water meter checked and placed in visible/readable location. 2.6.2 Valve installed on service pipe prior to water meter. 2.6.3 Water meter installed along water flow direction. 2.6.4 Pipes and pipe fittings installed without leakage.
	2.7 Clean work area	2.7.1 Tools and equipment cleaned, checked for faults, maintained and stored. 2.7.2 Work area cleaned and waste disposed in accordance with ***3R's principle.***
6	**Task Performance Requirements (Tools, Equipment and Materials):** • Measuring tape, pen, paper, pencil, sharpener, eraser, calculator, register, ruler, chalk, marker, scissors, try square, water level, spirit level, mason pan, clamp, rope, saddle, hammer, shovel, pick, bucket (*Thunchhe*), basket, brush, broom, dust pan, chain/pipe vice, hack saw, wooden saw, angle cutting saw, pipe cutter, files, pipe reamer, oil can, knife, chain pipe wrench, adjustable wrench, chamfering tools, HDPE heating plate, Teflon cloth, thermochrome chalk, thread seal tape, anti-corrosion coating, hemp/jute, PPR heating machine, solvent cement, chisel, screw drivers, pliers, allen key, threading tool, caulking tool, pipe bender, mortar board, mason trowel, mason hammer, claw hammer, stock and die, wheelbarrow, electro fusion machine, pressure test pump, pipes, valve, fittings, drum, water pump, water meter, cloth, brick, cement, sand, aggregates and Personal protective equipment (PPE).	

7	**Safety and Hygiene (Occupational Health and Safety):** • Use personal protective equipment. • Safe handling of materials, tools and equipment. • Hazards involved in lifting tools, equipment and materials. • Safe handling of debris. • Hazards involved in handling clay, sand and cement. • Hazards involved in sharp objects. • Hazards involved due to short circuit and electricity. • Hazards involved due to slippery floors.

8	Required Knowledge		
	Technical Knowledge	**Applied Calculation**	**Graphical Information**

	• Tools and equipment:
	  ○ Types
	  ○ Uses
	  ○ Safe handling
	• Fundamentals of public water pipeline
	  ○ Water source
	  ○ Water intake
	  ○ Water treatment process
	  ○ Reservoir/collection tank
	  ○ Transmission pipeline
	  ○ Distribution pipeline
	  ○ Service pipe connection
	  ○ Public tap stand
	• Type of surface
	• Pipe, fittings and valves
	  ○ Introduction
	  ○ Types
	  ○ Color code and pressure strength
	  ○ Uses
	  ○ Quality/standard
	  ○ Size and length
	  ○ Inner and outer diameter
		• Perform four basic fundamental operations
		• Convert metric unit to imperial and vice versa.
		• Calculate pipe length
			• Read and interpret plumbing and sanitary drawing.
			• Read and interpret instruction guide/manual.

	○ Insertion length ○ Symbol ○ Pipe fittings ○ Pipe jointing and fabrication ○ Pipe joining methods and techniques ○ Tolerance level • Units of measurement • Marking and layout technique • Public water supply estimation • Plumbing drawing ○ Introduction ○ Signs and symbols ○ Isometric drawing • Threading: ○ Application ○ Depth and length ○ lubricant • Trench excavation and back filling • Leakage test • Uses of water meter • Cement mortar • Waste management • Occupational health and safety rules and regulation • Use and importance of first aid kit		

9	**Assessment of Competency**					
	Unit: 2 **Unit Title: Install public water supply pipelines**					
	Candidate Details			**Assessors Detail**		
	Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:			Assessors' Name 1. 2. 3.		ID/License No:
Element of competency	**Performance Standards**		**Standard Met**	**Standard Not Met**	**Evidence Type**	**Comments**
2.1 Prepare tools, equipment and materials	2.1.1 ***Personal protective equipment (PPE)*** used in accordance with task requirement. 2.1.2 Tools and equipment collected and checked for working condition in accordance with task requirement. 2.1.3 Materials collected and prepared in accordance with task requirements.					
2.2 Prepare estimate	2.2.1 Worksite visited and ***required information*** collected. 2.2.2 Quantity of work determined and recorded. 2.2.3 Working hour estimated based on quantity and nature of work. 2.2.4 Cost of labour and materials determined based on quantity and nature of work.					
2.3 Prepare pipes	2.3.1 Size of ***pipes*** selected as per drawing and clearly marked to					

	dimension. 2.3.2 Pipes straightly cut along with marked line. 2.3.3 Thread prepared on GI pipe to ***standard thread length*** without damage. 2.3.4 Anti-rust paint uniformly applied on GI pipes. 2.3.5 ***Pipe jointing*** performed as per task requirement.				
2.4 Install pipe fittings	2.4.1 Pipe, ***pipe fittings*** and gasket checked for damage. 2.4.2 Insertion portion marked on pipe edge. 2.4.3 Lubricants evenly applied on gasket and pipe. 2.4.4 Gasket placed into CI/DI hub and checked for fitting defects. 2.4.5 Pipe inserted up to marking line into hub. 2.4.6 Pipe and pipe fittings joined without surface damage. 2.4.7 Seam formed as per HDPE pipe wall thickness with seam tolerance of +2 mm on joint part. 2.4.8 Leakage checked.				
2.5 Lay pipes	2.5.1 Trench and bedding size checked as per drawing and maintained. 2.5.2 Pipe and fittings cleaned and checked for damage. 2.5.3 Pipes laid on trench within level for distribution line. 2.5.4 Pipes joined to the specified dimension within tolerance ± 5 mm in center-to-center dimension without leakage. 2.5.5 Installation of pipes inspected for ***common defects*** and rectified.				

2.6 Install water meter	2.6.1 Physical condition of water meter checked and placed in visible/readable location. 2.6.2 Valve installed on service pipe prior to water meter. 2.6.3 Water meter installed along water flow direction. 2.6.4 Pipes and pipe fittings installed without leakage.				
2.7 Clean work area	2.7.1 Tools and equipment cleaned, checked for faults, maintained and stored. 2.7.1 Work area cleaned and waste disposed in accordance with ***3R's principle.***				

WT- Written Test **OQ**- Oral Question **PT-** Practical Test **DO** – Direct Observation **SR**- Supervisor's report **SN**–Simulation
RP- Role Play **PG –**Photographs **VD**- Video **CT** – Certificates **TS** – Testimonials (Reward) **PP** – Product Produced
CS – Case Study

Range Statement

Variable	Range
Personal Protective Equipment	*May include but not limited to:* • Helmet • Apron/Safety Jacket • Goggles • Gloves • Protective shoes • Mask • Safety belt • Ear plug
Required information	*May include but not limited to:* • Site condition • Distance • Alignment
Pipes	*May include but not limited to:* • Galvanised Iron (GI) pipe • Ductile Iron (DI) pipe • Cast Iron (CI) pipe • High Density Polyethylene (HDPE) pipe • Polyvinyl Chloride (PVC) pipe

Standard thread length	*May include but not limited to:* **Diameter of Pipe (Inch)** — **Thread Length (mm)** • ½ — 13 • ¾ — 15 • 1 — 17 • 1 ¼ — 19 • 1 ½ — 19 • 2 — 24
Pipe jointing	*May include but not limited to:* • Butt joint • Chemical joint • Screw/Threading joint • Electro fusion joint • Fusion joint • Flange joint • Gasket joint • Adhesive joint • Solvent cement joint • Socket and spigot joint • Welded joint
Pipe fittings	*May include but not limited to:* • Collar • Elbow • Gasket • Union

	• Reducer • Tee • Bend • Nipple • Trap • Cross • Offset • Socket
Common defects	*May include but not limited to:* • Leakage • Misalignment • Physical damage
3R's Principle	*May include but not limited to:* • Reduce • Reuse • Recycle