

APPLY WATER AND WASTEWATER TECHNOLOGY

UNIT CODE: CON/OS/CET/CC/07/6/A

UNIT DESCRIPTION

This unit describes the competence required to apply water & wastewater technology practices. It involves applying basic water supply principles, principles of wastewater collection & treatment and basic irrigation & drainage principles.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT This describes the key outcomes which make up workplace functions	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements (to be stated in passive voice) <i>Bold and italicized terms are elaborated in the Range</i>
1. Apply basic water supply principles	1.1 Water demand is calculated based on particular use 1.2 Sources of water are identified based on demand and particular <i>use</i> . 1.3 Water abstraction methods are identified based on the water source 1.4 Water treatment processes are identified based on water characteristics and water quality. 1.5 Water pipes and appurtenances are identified based on the design 1.6 Water supply symbols are identified based on international standards 1.7 Water distribution systems are identified based on design 1.8 Water storage structures are identified based on water system 1.9 Work safety is observed based on code of practice
2. Apply principles of wastewater collection and treatment	2.1 Need for wastewater collection and disposal are identified based on water quality standards 2.2 Sources of waste water are identified based on water quality standards 2.3 Sewer system layout is illustrated based on sewerage design manual 2.4 Sewerage systems are identified based on the design 2.5 Sewer appurtenances are illustrated based on sewer code 2.6 Wastewater is characterized based on effluent discharge regulations (NEMA). 2.7 Wastewater treatment processes are identified based on wastewater characteristics

	<p>2.8 Principles of Wastewater treatment are described based on treatment unit.</p> <p>2.9 Wastewater symbols are identified based on international standards</p> <p>2.10 Wastewater colour coding for pipes and exhauster trucks are identified based on international standards.</p> <p>2.11 Work safety is observed based on code of practice</p>
3. Apply basic irrigation and drainage principles	<p>3.1 Crop water requirement is determined based on agronomic requirements.</p> <p>3.2 Land is prepared based on the crop, type of irrigation method, size of the land, topography and available technology</p> <p>3.3 Irrigation farm layout is identified based on design principles</p> <p>3.4 Quality of irrigation water is identified based on the standards</p> <p>3.5 Irrigation methods are identified based on the type of crop, type of soil, resources available, quantity and quality of water</p> <p>3.6 Methods of drainage are identified based on crop water requirement, type of soil, quantity and quality of water.</p> <p>3.7 Work safety is observed based on code of practice</p>

RANGE

Variable	Range
1. Water demand may include but not limited to:	<ul style="list-style-type: none"> • Industrial • Domestic • Irrigation • Livestock • Commercial • Recreation
2. Sources of water may include but not limited to:	<ul style="list-style-type: none"> • Surface • Ground • Rain water
3. Water abstraction methods may include but not limited to:	<ul style="list-style-type: none"> • River intake & diversion structures • Simple submerged intakes • Intake towers (wet and dry) • Intake for sluice-ways of dams • Roof and rock catchments • Boreholes and shallow wells

	<ul style="list-style-type: none"> • Floating water intake
4. Water treatment processes may include but not limited to:	<ul style="list-style-type: none"> • Household treatment methods (boiling, disinfection, ceramic filters, filtration, SODIS, sand filtration, flocculation). • Filtration and membrane technologies e.g. reverse osmosis, • Conventional processes (Screening and aeration, sedimentation, filtration, coagulation and flocculation, disinfection)
5. Water pipes may include but not limited to:	<ul style="list-style-type: none"> • Metallic (GI, Steel, ductile iron, cast iron) • Plastic (PVC, uPVC, CPVC, PE,PPR, PEX) • Cement (RC pipes)
6. Appurtenances may include but not limited to:	<ul style="list-style-type: none"> • Valves (gate valve, sluice valves, ball valves, globe valves, butterfly valves, taps, check valves, PRV, pressure relive valves, float valves, air valves, washouts) • Meters (displacement meters, velocity meters, ultra sonic, electromagnetic.) • Fittings (couplings, adapters) • Valve Chambers
7. Water supply symbols may include but not limited to:	<ul style="list-style-type: none"> • Valves • Meters • Pumps
8. Water distribution systems may include but not limited to:	<ul style="list-style-type: none"> • Grid iron • Radial • Dead end
9. Water storage structures may include but not limited to:	<ul style="list-style-type: none"> • Weirs and Dams • Tanks (elevate, surface and sub-surface) • Water pans& ponds
10. Types of sewers may include but not limited to:	<ul style="list-style-type: none"> • outfall sewer, • intercepting sewer, • lateral sewer, • main sewer, • relief sewer, • Sewer systems, • private sewer
11. Characteristics of wastewater may	<ul style="list-style-type: none"> • physical, • biological, • chemical

include but not limited to:	
12. Effluent discharge Regulations may include but not limited to:	<ul style="list-style-type: none"> • Public sewers • Environment
13. Sewer appurtenances may include but not limited to:	<ul style="list-style-type: none"> • Manholes (Shallow, Deep, Drop), • Inlet, • catch basins • clean out, • flushing tank, • flushing units, • lamp holes,
14. Wastewater symbols may include but not limited to:	<ul style="list-style-type: none"> • manhole • sewer lines • pumps
15. sources of waste water may include but not limited to:	<ul style="list-style-type: none"> • Industrial • domestic, • storm, • Agricultural
16. Sewerage System layout may include but not limited to:	<ul style="list-style-type: none"> • Sewage • sewerage, • sewer, • outfall sewer, • intercepting sewer, • lateral sewer, • main sewer, • relief sewer, • Sewer systems, • private sewer
17. Sewerage systems may include but not limited to:	<ul style="list-style-type: none"> • Separate, • Combined, • Partially separate
18. Treatment processes may include but not limited to:	<ul style="list-style-type: none"> • Screening, • Grit removal, • Primary sedimentation, • Filtration – trickling, • Secondary sedimentation, • Sludge digestion, • Sludge drying

	<ul style="list-style-type: none"> • Waste stabilization ponds (Anaerobic, Facultative, Maturation)
19. Wastewater colour coding may include but not limited to:	<ul style="list-style-type: none"> • Black • Yellow • Brown
20. Sources of water for irrigation	<ul style="list-style-type: none"> • Surface • Ground • Rain • Technological water
21. Quality of irrigation water may include but not limited to:	<ul style="list-style-type: none"> • Physical • Chemical • biological
22. Irrigation methods may include but not limited to:	<ul style="list-style-type: none"> • surface methods • subsurface methods • overhead methods
23. Method of drainage may include but not limited to:	<ul style="list-style-type: none"> • surface • sub-surface

REQUIRED KNOWLEDGE

- Tools and equipment
- Safety regulations
- Mathematics
- Water cycle
- Water pipes
- Plumbing
- Water pump operation
- Pipe fitting

SKILLS

- Analytical
- Critical thinking
- Problem solving
- Firefighting
- Quality control
- Circuit interpretation

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Calculated water demand based on the particular water use 1.2 Identified the sources of water based on the water demand and particular use 1.3 Identified abstraction methods based on the water sources 1.4 Identified water treatment processes based on water characteristics and water quality 1.5 Identified water pipes and appurtenances based on design 1.6 Identified water supply symbols based on international standards. 1.7 Identified water distribution systems based on the design. 1.8 Identified water storage structures based on water system 1.9 Identified Need for wastewater collection and disposal based on water quality standards 1.10 Identified sources of waste water based on water quality standards 1.11 Illustrated Sewer system layout based on sewerage design manual 1.12 Identified sewerage systems based on the sewerage design Manual 1.13 Illustrated Sewer appurtenances based on sewer codes 1.14 Characterized Wastewater based on effluent discharge regulations (NEMA). 1.15 Identified Wastewater treatment processes based on wastewater characteristics 1.16 Described Principles of Wastewater treatment based on treatment process 1.17 Identified wastewater symbols based on international standards. 1.18 Identified wastewater colour codes based on international standards. 1.19 Observed work safety based on code of practice. 1.20 Determined crop water requirements based on agronomic requirements. 1.21 Prepared Land based on the crop, type of irrigation method, size of the land, topography and available technology
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	<p>1.22 Identified Irrigation farm layout based on design principles</p> <p>1.23 Identified Quality of irrigation water based on the standards</p> <p>1.24 Identified Irrigation methods based on the type of crop, type of soil, resources available, quantity and quality of water</p> <p>1.25 Identified Method of drainage based on crop water requirement, type of soil, quantity and quality of water.</p> <p>1.26 Work safety is observed based on code of practice</p>
2. Resource Implications	<p>The following resources should be provided:</p> <p>2.1 Scientific calculator</p> <p>2.2 Water distribution system models</p> <p>2.3 Population forecasting charts</p> <p>2.4 Water supply symbols charts</p> <p>2.5 Masonry and plastic tank models</p> <p>2.6 Model sewer system</p> <p>2.7 Wastewater laboratory</p> <p>2.8 Wastewater pipes</p> <p>2.9 Pipework & plumbing workshop</p> <p>2.10 Water quality laboratory</p> <p>2.11 Wastewater symbols chart</p> <p>2.12 Demonstration farm</p> <p>2.13 Models of farm implements</p> <p>2.14 Soil water, plant relationship chart</p> <p>2.15 Drainage models</p> <p>2.16 Irrigation laboratory</p> <p>2.17 Demonstration safety gear</p>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <p>3.1 Written text(s)</p> <p>3.2 Interview(s)</p> <p>3.3 Observations</p>
4. Context of Assessment	<p>Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment or during industrial attachment.</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>