

## Unit 63: Public Health Engineering in Civil Engineering

Unit code: T/600/0431

QCF Level: 3

Credit value: 10

Guided learning hours: 60

### Unit aim

This unit gives learners the opportunity to gain an understanding of below ground drainage systems and the methods used to treat domestic sewage. Learners will also gain knowledge of the methods used to dispose of solid waste and the processes used to produce drinking water.

### Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning outcomes	Assessment criteria
1 Understand below ground drainage systems	1.1 Explain how below ground drainage systems are used to dispose of foul water from buildings
	1.1 Explain how below ground drainage systems are used to dispose of surface water
2 Understand the methods used to treat domestic sewage	2.1 Explain how domestic sewage is treated
3 Know the methods used to dispose of solid waste	3.1 Describe the methods used to dispose of solid domestic waste
4 Know the processes used to produce drinking water	4.1 Describe the stages of the processes used to purify and store drinking water

## Unit content

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### 1 Understand below ground drainage systems

*Below ground drainage systems:* disposal; types; design requirements; design calculations; materials and installation techniques; soundness and performance; servicing and maintenance

*Disposal:* of foul water; of surface water

*Types:* combined systems; totally separate systems; partially separate systems; grey water systems; eg domestic dwellings, small commercial and industrial buildings, small housing developments, small industrial/commercial trading estates

*Design requirements:* ventilation of below ground drainage systems; use of open vents and air admittance valves (AAV); limitations on use of AAV; access to below ground drainage systems; rainwater storage and use; grey water storage and use

*Design calculations:* size of drain; depth of flow; self-cleansing velocity and inclination of drains from given data; methods of determining drain/sewer loadings; self-cleansing velocity and inclination of sewers from given data; maximum depth of flow; Chezy equation; Chezy-Manning equation; continuity equation

*Materials and installation techniques:* common materials used for below ground drainage systems; methods of jointing different below ground drainage materials; bedding of drains; depth of cover; arrangements for drains passing through building structures

*Soundness and performance:* tests to below ground drainage systems; alignment tests; mirror and torch tests; obstruction test; rolling ball test; soundness tests; hydraulic and pneumatic tests

*Servicing and maintenance:* health, safety and welfare; personal hygiene and protective clothing and equipment; tools and equipment required for servicing and maintenance; work sequences and methods of carrying out servicing and maintenance tasks; testing of drains and sewers for toxic or explosive gases

### 2 Understand the methods used to treat domestic sewage

*Treatment of domestic sewage:* sewage treatment plants; septic tanks; cesspits

*Requirements for each method:* location; design; method of operation; sizing based on population; disposal of sludge; disposal of water after treatment; vehicle access

### 3 Know the methods used to dispose of solid waste

*Methods:* refuse chutes; landfill; compaction, composting; incineration; sorting, disposal and recycling of solid waste

*Solid domestic waste:* organic waste (food, garden waste); combustibles (paper, wood, dried leaves, packaging); non-combustibles (metals, tin cans, bottles); ashes; dust; hazardous materials (oils, batteries, sticking plasters, bandages)

*Requirements and constraints:* legal requirements; health, safety and welfare; damage to the environment; cost implications

#### **4 Know the processes used to produce drinking water**

*Drinking water:* rainfall; sources of supply; hardness; purification for drinking; storage and distribution

*Rainfall:* hydrological cycle (evaporation, condensation, precipitation); absorption of carbon dioxide, sulphur dioxide and oxides of nitrogen

*Sources of supply:* eg rivers, streams, shallow wells, deep wells, bore holes, desalination impounding reservoirs; river management; weirs; flood plains

*Hardness:* hard and soft water; temporary hardness and permanent hardness; pH values; removal of temporary hardness; removal of permanent hardness by the base-exchange process; hardening of acidic water to prevent corrosion; plumbo-solvency and cupro-solvency; palatability

*Purification for drinking:* properties of potable water supplies eg colour, turbidity, taste and odour; protection of the gathering grounds; effects of livestock, cultivation, nitrates and landfill; storage, impounding and storage/settlement in reservoirs; filtration eg slow sand filters, rapid sand filters, microstraining; sterilisation and chlorination of water supplies

*Storage and distribution:* service reservoirs; pumping stations; use of water towers or expansion/pressure vessels; diagrammatic layouts of each method highlighting the components for each installation, distribution, water-main grid systems; minimum pressure; methods of isolation; materials and jointing methods used; disinfection

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