



Unit Title	Hydraulic principles and application in the water industry (D/506/1620)	
Level	4	
Credit Value	12	
Learning Outcomes – the learner will be able to:	Assessment Criteria – the learner can:	
1. Solve engineering hydrostatic problems	1.1	explain the construction and application of pressure measuring devices .
	1.2	carry out calculations to determine the magnitude and position of hydrostatic forces .
2. Solve engineering flow problems	2.1	carry out calculations for pipeline flow problems
	2.2	carry out calculations for open channel flow problems .
	2.3	explain the significance of pressure, flow and head and their relationship to the water distribution system.
3. Match pumps to the demands of a specific system	3.1	carry out calculations to match pumps to the requirements of a specific system .
4. Undertake hydraulic experimental procedures	4.1	carry out laboratory investigations into hydraulic behaviour.
	4.2	produce reports on the findings of hydraulic laboratory investigations .

Additional information about the unit	
Unit purpose and aims	<p>This unit provides learners with an opportunity to develop the skills required to solve hydrostatic and flow problems, select appropriate pumps and undertake experiments in hydraulics.</p> <p>On completion of the unit the learner will be able to:</p> <ul style="list-style-type: none">• solve engineering hydrostatic problems• solve engineering flow problems• match pumps to the demands of a specific system• undertake hydraulic procedures.
Unit expiry date	31/03/2019
Assessment requirements or guidance specified by a sector or regulatory body (if appropriate)	<p>Laboratory facilities are essential for learners to undertake experimental work on a hydraulic bench/flume, and develop competence in using measuring instruments to record, analyse and present results.</p> <p>In the assessment of this unit, the learner must ensure that the evidence that they produce covers the following:</p> <ol style="list-style-type: none">1. Pressure measuring devices must include:<ol style="list-style-type: none">(a) manometers



	<ul style="list-style-type: none">(b) other instruments used to measure fluid pressure and pressure differentials. <ol style="list-style-type: none">2. The calculations to determine the magnitude and position of hydrostatic forces must cover the magnitude and location of hydrostatic forces acting on submerged bodies (plane and curved faces, vertical and inclined surfaces).3. The learner's calculations and explanations in respect of pipeline flow problems must cover the following:<ul style="list-style-type: none">(a) pipeline flow problems(b) flow classification (laminar and turbulent flow; uniform and non-uniform flow; steady and unsteady flow)(c) analytical principles (continuity; conservation of energy – Bernoulli's equation; forces due to rate of change of momentum)(d) closed conduit flow (frictional head loss in pipe and pipe systems; minor (form) head losses; roughness and variation of friction factor.)4. The learner's calculations and explanations in respect of open channel flow problems must cover the following:<ul style="list-style-type: none">(a) uniform open channel flow (Chezy and Manning velocity equations; normal and critical depths; specific energy and specific force; super-critical flow; the hydraulic jump).(b) flow measurement in open channels (velocity area methods; gauging structures – e.g. broad crested weir; Venturi flame).5. Pump matching must include:<ul style="list-style-type: none">(a) energy and hydraulic gradients in pump-pipeline systems(b) pump performance and characteristic curves(c) pump selection to operate in a given system(d) pumps in series and parallel.6. The systems for which pump matching is carried out must cover:<ul style="list-style-type: none">(a) hydrodynamic machines(b) classification of pumps and turbines (radial, axial, reaction).7. The laboratory investigations into hydraulic behavior must cover:<ul style="list-style-type: none">(a) determination and investigation of hydrostatic forces(b) pressure measurement(c) velocity and flow measurement (for pipes and open
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	<p>channels)</p> <p>(d) energy losses (pipe systems)</p> <p>(e) hydraulic jumps</p> <p>(f) pump characteristics.</p> <p>The assessment of this unit will be via a combination of centre-devised assignments and tests, and will be conducted in supervised conditions. The assessment strategy for the unit has been agreed with industry stakeholders.</p>
Location of the unit within the subject/sector classification system	4.1 Engineering
Name of the organisation submitting the unit	CABWI Awarding Body
Availability for use	Shared
Unit guided learning hours	48