



Australian Government

NWPHYD002 Apply principles of open channel hydraulics

Release: 2

NWPHYD002 Apply principles of open channel hydraulics

Modification History

Release 2: Competency Field changed from Hydrology to Hydrometric Monitoring.

Release 1: This is the first release of this unit of competency in the NWP National Water Training Package.

Application

This unit involves the skills and knowledge required to apply principles of open channel hydraulics.

It includes using hydraulic principles, calculating theoretical flows, collecting, interpreting, verifying data and applying theoretical techniques to produce flow data essential to performance. It also includes applying relevant legislation, regulations, industry standards and workplace policies and procedures.

This unit applies to water operators involved in the monitoring of all elements of the water cycle and impacts on the environment. Those undertaking this unit would work in small teams, autonomously or under supervision, while performing complex tasks in a broad range of contexts that could be unpredictable, including remote, confined spaces, near water and/or at heights.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Not applicable.

Competency Field

Hydrometric Monitoring

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

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| 1 Select open channel hydraulic methodology | 1.1 Identify monitoring objectives of the site and hydraulic calculation requirements |
| | 1.2 Select methodology for open channel hydraulic calculations |
| | 1.3 Identify hydraulic principles used for verification of calculations |
| | 1.4 Select other methodologies to review initial calculations |
| 2 Collect and review data for flow calculations | 2.1 Measure and collect appropriate data to calculate theoretical flows based on methodology selected |
| | 2.2 Determine the hydraulic characteristics of a monitoring site |
| | 2.3 Measure and collect appropriate data to calculate flows theoretically |
| | 2.4 Estimate hydraulic coefficients based on observations |
| | 2.5 Prepare records in a format suitable for dissemination |
| | 2.6 Review data collected and subsequent calculations for inconsistencies against measured flows |
| 3 Select the appropriate control structure | 3.1 Select appropriate control structures based on characteristics of the open channel and its catchment |
| | 3.2 Identify and determine the method to calculate flow by using the appropriate formulae for the control structure |
| 4 Calculate flow in open channels | 4.1 Select and use the appropriate formulae for calculating flows in open channels based on the characteristics of the open channel and its catchment |
| | 4.2 Identify the limitations of the formulae |
| | 4.3 Identify factors that would cause variations in the results |
| | 4.4 Verify results by applying hydraulic principles and other methodologies |
| | 4.5 Determine the characteristics of open channel pipe flow |
| 5 Calculate flow from pressure measurements | 5.1 Determine flow-based calculations by using pressure instruments |
| | 5.2 Make adjustments for absolute pressure instruments to |

measure head in open channels

- 5.3** Make corrections in pressure measurements to allow for head measurement of salt water

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Unit Mapping Information

This unit replaces and is equivalent to NWPHYD001 Apply principles of open channel hydraulics.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=26336bc0-04e5-49d9-8c31-46c49b6a0037>

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Assessment Requirements for NWPHYD002 Apply principles of open channel hydraulics

Modification History

Release 2: Minor document layout changes, no content changes

Release 1: This is the first release of this unit of competency in the NWP National Water Training Package

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria on at least one occasion and includes:

- checking data for inconsistency against measured flows
- identifying types of flows
- interpreting and applying technical documentation to the collection, analysis and reporting of hydrometric data
- presenting calculations and disseminating information
- selecting, performing and using relevant calculations associated with applying principles of open channel hydraulics including:
 - calculating hydraulic energy gradients
 - calculating minor energy losses associated with enlargements, contractions and bends
 - calculating the gradual varied flow profiles in uniform channels when the discharge is known
 - drawing velocity distribution curves for fluids in pipes or channels with both laminar flow and turbulent flow
 - using data to determine the value of roughness
 - using simple equations for determining channel friction with their appropriate application
- using recording and reporting systems
- using surveying techniques
- verifying results by applying hydraulic principles and other methodologies including:
 - estimating calculations based on observations
 - using continuity equations
 - using technology to perform high level calculations for channel hydraulics

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all the requirements of the elements and performance criteria and includes knowledge of:

- applications and characteristics of notches and weirs, including type of the crest, shape of the

- notch, crest and conditions
- characteristics of open channels including:
 - critical
 - laminar
 - state of open channel flow
 - steadiness
 - subcritical and supercritical flow
 - transitional and turbulent flow
 - types of data including photographic, surveying, long-section and cross-section, topographic maps and historical
 - types of open channel
 - uniformity
- effect of velocity variation on velocity head
- flow conditions associated with open channel hydraulics including:
 - backwater
 - characteristics of open channel pipe flow
 - critical flow
 - distinction between laminar and turbulent flow
 - full pipe flow
 - laminar flow
 - rapidly changing flow
 - smooth, rough pipe and channel surfaces
 - subcritical and supercritical flow
 - submerged flow conditions
 - turbulent flow
 - uniform flow
 - weir and flumes behaviour under various flow conditions
- hydraulic calculations including:
 - estimating calculations
 - fluid dynamics
 - hydraulic mechanics
 - measuring and collecting data
 - principles of fluid statics
- mathematical formulae and calculation techniques for calculating channel hydraulics including:
 - application of matrix algebra to systems of linear equations
 - Bernoulli's equation
 - Darcy–Weisbach equation
 - equations for calculating the approximate value of the friction factor, the characteristics of flow through notches/weirs, including the use of these in channel flow measurement

- graphical and algebraic methods for solving systems of linear, quadratic, exponential, logarithmic and trigonometric equations
- Hagen–Poiseuille equation
- limitations of formulae
- Pascal’s law and hydrostatic effect on submerged surfaces

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations. Where this is not appropriate, assessment must occur in suitable simulated workplace operational situations reflecting actual workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment currently used in industry
- applicable relevant documentation including workplace procedures, industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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