C SERIES

Multi-Purpose Teaching Flume - C4-MKII

The Armfield Multi-purpose Teaching Flume has been specifically designed to demonstrate the principles of fluid mechanics when applied to engineering structures in open channel flow.

COST EFFECTIVE LABORATORY FLUME FOR TEACHING AND RESEARCH PURPOSES

The C4-MKII version is supplied as an accessory to the F1-10 Hydraulics Bench

C4-MKII - Teaching flume

C4-69 - Artificially roughened bed

Sharp Crested Weir (in vented condition)

Experimental content

- Study of open channel flume
- Use of hook and point gauges to measure water level
- Learning how to apply force-momentum and steady-flow energy equations to simple flow situations
- Understanding the relationship between water level above the crest of a weir and flow rate over the weir
- Using hydraulic structures to control level, e.g. siphon spillways
- Understanding sub and super-critical flow and the underlying characteristics of waves
- Hydraulic jump
- Using hydraulic structures for control of flow, eg sluice gate
- Applying and understanding Manning's formula
- Use of a Pitot static tube to measure flow rate and velocity profiles (using optional C4-61)

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Issue: 2
URL: http://www.armfield.co.uk/c4mkii

Applications
ChE ME CE IP

Description

The C4-MKII is a small open channel flume, available in 2.5m or 5.0m lengths, with clear acrylic sides to the working section for complete visibility of the flow.

The channel is fitted with a PVC inlet tank and is designed for free discharge into the Hydraulics Bench. The flume is mounted on a rigid framework and can be tilted by use of a calibrated screwjack, which enables accurate slope adjustment of the channel.

The inlet tank incorporates a stilling arrangement to diffuse the water flow prior to entry into the channel, ensuring smooth uniform flow. The level in the working section of the flume is controlled using an overshot weir (stop logs) at the discharge end.

Bed-pressure tappings and fixing points for models are provided.

A longitudinal scale positioned at the top of the channel enables depth gauges and pitot static tubes to be accurately positioned along the channel length.

The flume is designed for use with a standard Armfield F1-10 Hydraulics Bench, which provides the pumped water flow, the flow control valve and a volumetric tank for flow measurement.

Also available is an optional flow meter, which can be fitted to the C4-MKII to enable direct flow measurements to be taken.

Optional educational software is available (C4-MKII-ABASIC) offering a complete teaching package of coursework. The student manually enters data in the software, which can then be used for calculations, data processing and graph plotting.

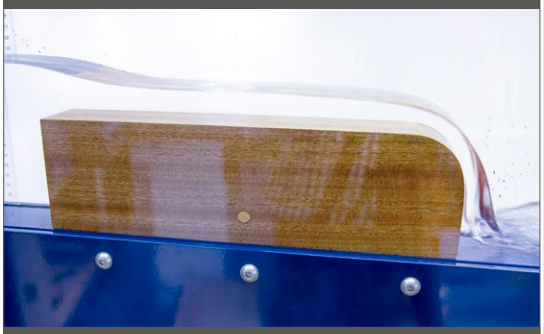
Detailed experimental content

- To determine the relationship between upstream head and flowrate for water flowing over a Sharp Crested weir
- To calculate the discharge coefficient and to observe the flow patterns obtained over a Sharp Crested weir
- To determine the relationship between upstream head and flowrate for water flowing over a Broad Crested weir (long base weir)
- To calculate the discharge coefficient and to observe the flow patterns obtained over a Broad Crested weir (long base weir)
- To determine the relationship between upstream head and flowrate for water flowing over a Crump weir
- To determine the modular limit and to observe the flow patterns obtained over a Crump weir
- To determine the relationship between upstream head and flowrate for water flowing under a sluice gate (undershot weir)
- To calculate the discharge coefficient and to observe the flow patterns obtained under a sluice gate (undershot weir)
- To determine the relationship between upstream head and thrust on a sluice gate (undershot weir) for water flowing under the sluice gate
- To determine the relationship between the specific energy and upstream head for water flowing under an undershot weir
- To investigate the characteristics of a standing wave (the hydraulic jump) produced when water flows beneath an undershot weir and to observe the flow patterns obtained
- To determine the relationship between upstream head and flowrate for water flowing through a Venturi flume
- To calculate the discharge coefficient and to observe the flow patterns obtained through a Venturi flume
- To determine the characteristics and observe the flow patterns obtained for water flowing through a culvert. Requires C4-62
- To observe the flow patterns obtained for water flowing around splitters with different profiles. Requires C4-63
- To observe the flow patterns associated with the flow of water over a dam spillway. Requires C4-64
- To determine the relationship between upstream head and flowrate through a siphon spillway in the "blackwater" fully primed condition. Requires C4-65
- To calculate the discharge coefficient and to observe the operation of the siphon as it primes and de-primes. Requires C4-65
- To determine the relationship between upstream head and flowrate through an air regulated siphon. Requires C4-65
- To calculate the discharge coefficient and to observe the operation of the air regulated siphon as it primes and de-primes. Requires C4-65
- To determine the relationship between upstream head and flowrate beneath a radial gate (Tainter Gate) under different operating conditions. Requires C4-66
- Calculate the discharge coefficient in each position of the radial gate. Requires C4-66
- To observe the flow patterns associated with the flow of water over different bed profiles. Requires C4-68
- To determine the effect of a roughened bed on the depth of water at different flowrates and to obtain appropriate coefficients to satisfy the Manning Formula. Requires C4-69
- To determine the effect of different wave regimes on different flow patterns. Requires C4-67

Accessories supplied with the standard flume

Adjustable undershot weir

Broad crested weir



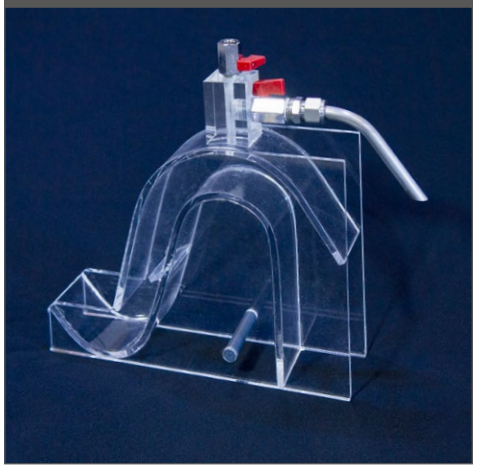
Crump weir

Venturi flume

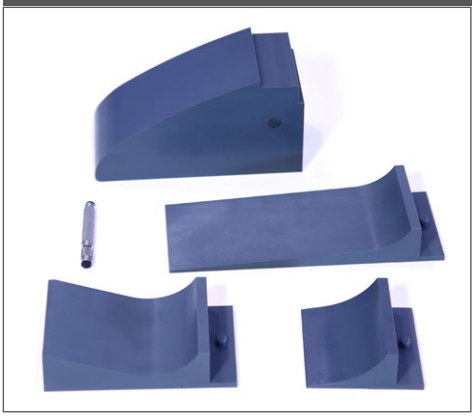
Sharp Crested Weir shown in unvented condition

Other available accessories for the flume

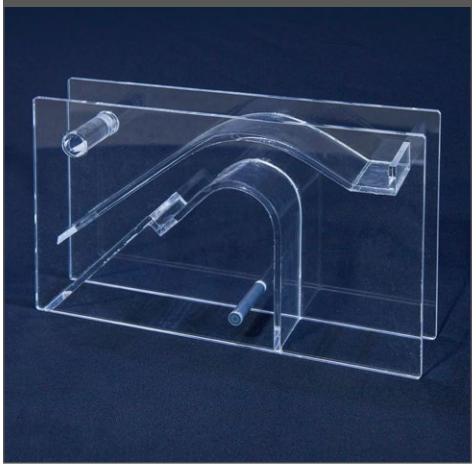
C4-65 - Air-regulated syphon



C4-64 - Free overflow spillway section complete with ski jump, sloping apron and blended reverse curvature attachments

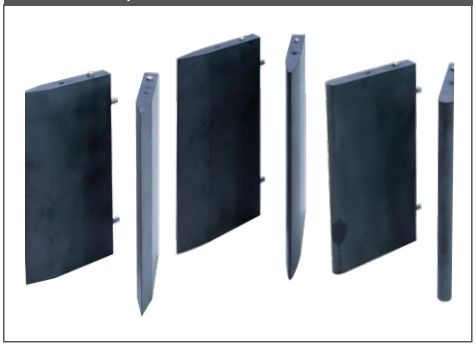


C4-65-Siphon spillway



C4-61 - Pitot tube and manometer

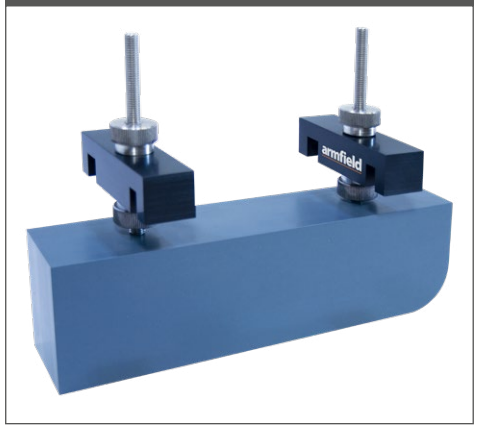
C4-63 - Flow splitters; central wall with various nose pieces



C4-66 - Model radial gate

C4-68 - False floor sections

C4-62 - Culvert fitting has square, rounded edges



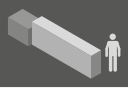
C4-67 - Wave generator and wave absorbing beach

C4-69 - Artificially roughened bed

Requirements

F1-10 | PC | USB

Scale



- Electrical supply: The F1-10 requires an electrical supply, please refer to the F1 data sheet for details.
- F1-10-A: 220-240V / 1ph / 50Hz / 10A
- F1-10-B: 110-120V / 1ph / 60Hz / 10A
- F1-10-G: 220V / 1ph / 60Hz / 10A
- F1-10-2-A: 220-240V / 1ph / 50Hz / 10A
- F1-10-2-B: 110-120V / 1ph / 60Hz / 10A
- F1-10-2-G: 220V / 1ph / 60Hz / 10A

Technical specifications

Models and gauges supplied	
	Venturi flume
	Sharp and broad-crested weirs
	Crump weir
	Adjustable undershot weir
	Two Vernier level gauges (Hook and point gauges)
Channel dimensions	
Width	76mm
Height	250mm
Channel Slope	Adjustable between -1% and +3%

Overall dimensions

Model	C4-MKII-2.5M	C4-MKII-5.0M
Length	2.91m	5.41m
Width	0.62m	0.62m
Height	1.46m	1.46m
Packed and crated shipping specifications		
Volume	2.8m^3	3.0m^3
Gross weight	330kg	380kg

Related products

C4-61: Pitot tube and manometer

C4-62: Culvert fitting, one edge square, one rounded

C4-63: Flow splitters; central wall with various nose pieces

C4-64: Free overflow spillway section complete with ski jump, sloping apron and blended reverse curvature attachments

C4-65: Siphon spillway and air-regulated siphon

C4-66: Model radial gate

C4-67: Wave generator and wave absorbing beach

C4-68: False floor sections for gradually varied profiles

C4-69: Artificially roughened bed 2.5m-long section (two required for a 5m flume)

Essential accessories / equipment

Armfield F1-10 Hydraulics Bench

Software

Optional educational software is available (C4-MKII-ABASIC) offering a complete teaching package of coursework.

The student manually enters data in the software, which can then be used for calculations, data processing and graph plotting.

Ordering specification

- A 76mm wide, 250mm high open channel for use with an F1-10 Hydraulics Bench
- Available in 2.5m and 5.0m working section lengths
- Clear acrylic sides to give visibility of the working section
- A jacking system permits the slope of the channel bed to be adjusted between -1% and +3%
- Inlet tank with flow stilling arrangement
- Includes a Venturi, sharp and broad-crested weirs, 2 vernier level gauges, adjustable undershot weir and crump weir
- Wide range of other models available as accessories
- Optional flow meter
- Comprehensive instruction manual

Ordering codes

C4-MKII-2.5M-10
Multi-purpose Flume, 2.5m, with basic accessories

C4-MKII-5.0M-10
Multi-purpose Flume, 5m, with basic accessories

C4-MKII-ABASIC
Educational Software

Armfield standard warranty applies with this product