

SERIES

FEL Series Irrigation Water Management

The Armfield FEL Series - With continued population growth in parts of the world where growing crops is most challenging, irrigation is the obvious way to maximise the potential yield.

This range of products offers both laboratory and field-learning opportunities. It also introduces such diverse topics as crop water requirements, soil moisture content, plant water need and sprinkler irrigations systems.





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Irrigation Water Management / FE series

SERIES

The Surface Irrigation Apparatus, FEL2 has been developed to help students of irrigation understand more fully the interaction of factors which influence water movement both on the soil surface and in the soil profile.

The equipment allows actual surface irrigation experiments to be performed on a small scale in the laboratory.

Soil/Water Model Tank – FEL2

FOR LABORATORY-SCALE INVESTIGATIONS OF SURFACE IRRIGATION AND RELATED SYSTEMS



Experimental content

- Understand surface and sub-surface effects of surface water application
- Understand optimum irrigation application rates to maximise infiltration and minimise surface run-off
- Demonstrating the effect of rate of discharge on the advance and infiltration of water into the soil
- Demonstrating the effect of soil texture on the advance and infiltration of water into the soil

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- Demonstarting the effect of land slopes on the advance and infiltration of water into the soil
- Demonstarting the effect of surface irregularities on the advance and infiltration of water into the soil
- Demonstrating the use of drip irrigation methods and how drip rate and spacing of drip points affects the wetted profile within the soil
- Demonstrating by visualising the flow lines how a tile drain works

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Description

The apparatus consists of a narrow transparent fronted tank, which may be partially filled with any soil type. It is supported on a bench mounted frame. The equipment is self-contained with a sump tank, pump and flow meter fitted behind the tank.

Water may be discharged along the soil surface or directed to twin drip nozzles to demonstrate trickle irrigation. Measurement of rates of water penetration into the soil is aided by a grid on the tank front.

Removable end plates enable soil samples to be changed quickly and easily.

Scale

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Requirements

Electrical supply:

FEL2-A:	220-240V/1Ph/50Hz
FEL2-B:	120V/1Ph/60Hz
FEL2-G:	220-240V/1Ph/60Hz

Cold water supply



Overall dimensions

Length	1.1m	
Width	0.5m	
Height	0.75m	
Packed and crated shipping specifications		
Volume	0.9 m ³	
Gross Weight	130kg	

Ordering specification

Soil/Water Model Tank comprising:

- Sand tank, 1.00m x 0.025m x 0.450m (L x W x H)
- One large side formed from a sheet of transparent material
- Metal frame supporting sump tank from which water is pumped via a flow meter to the soil surface
- Flood and drip surface outlets (two can be used together by fitting a Y-connector)
- Overflow system to remove surface water to sump
- Complete with instruction manual



FEL2 - Supplied accessories

Ordering codes

FEL2-A:	220-240V/1Ph/50Hz

- ► FEL2-B: 120V/1Ph/60Hz
- ► FEL2-G: 220-240V/1Ph/60Hz

Knowledge base

> 28 years expertise in research & development technology
> 50 years providing engaging engineering teaching equipment
Benefit from our experience, just call or email to discuss your
laboratory needs, latest project or application.



Aftercare

Installation Commissioning Training Service and maintenance Support: armfieldassist.com

Irrigation Water Management / FE series

Rainfall Simulator – FEL3



The FEL3 Rainfall Simulator can be used in the laboratory or in the field for a wide range of research from studies of infiltration under sprinkler irrigation to estimating soil loss in high intensity tropical storms.

Erodibility of soils can be studied in the laboratory and the influence of crop cover on the effect of rainfall can also be investigated.

It is ideal for investigating the relationship between rainfall and soil erosion, the nature of soil erosion potential on different soil types and identifying methods by which erosion may be prevented.

THE SIMULATOR INCORPORATES: APERTURE ADJUSTMENT FIELD AND LAB TEST PLOTS TILTING STAND RAIN GAUGES

Experimental content

- ▶ Investigate the relationship between rainfall intensity and soil erosion
- Investigate the nature of soil erosion potential on different soil types
- Investigate the methods by which soil erosion may be prevented

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- Determine the kinetic energy of simulated rainfall at various rainfall intensities
- Obtain a relationship between splash erosion and intensity of simulated rainfall

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Applications ChE IP

Description

The Rainfall Simulator consists of a metal frame that supports the spray head assembly. The unit may be placed directly on the ground for field studies or used with its accessory tray for laboratory experiments. In use, water is pumped from the holding tank via a control valve to the spray nozzle.

Water from the spray nozzle is interrupted by a horizontal rotating disc driven by a variable speed motor. Adjustable width apertures in the disc enable some water to pass and the remainder is recirculated via the tank. For use in field or laboratory, electrical and water supplies are required.

Requirement	s Scale
1Ph COLD	Č †
Electrical supp	ly:
FFI 3-A:	220-240V/1Ph/50Hz

FEL3-A: 220-24

- FEL3-B:120V/1Ph/60HzFEL3-G:220-240V/1Ph/60Hz
- **ELJ-G.** 220-2407/17170
- Cold water supply



Overall dimensions

Length	2.65m	
Width	1.60m	
Height	2.70m	
Packed and crated shipping specifications		
Volume	3.9m ³	
Gross weight	576Kg	

Ordering specification

Rainfall Simulator comprising:

- Spray head assembly supported by metal stand
- Storage tank from which water is pumped to spray head via flow meter and control valve
- Small square test plots
- Field test plots
- Tilting stand for test plots
- Sample vessels
- Rain gauges
- Complete with instruction manual





Ordering codes

- ► FEL3-A: 220-240V/1Ph/50Hz
- **FEL3-B:** 120V/1Ph/60Hz
- ► FEL3-G: 220-240V/1Ph/60Hz



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Irrigation Water Management / FE series



Soil Moisture Suction Sand Table – FEL4

Primarily for the derivation of soil moisture characteristic curves, the FEL4 helps in understanding the principle of water retentivity and its relationship with soil moisture levels.



Experimental content

- Understand the principles of water retentivity in terms of soil suction
- Demonstrate the relationship between soil texture and soil water characteristics
- Understand the relationship between water retentivity and soil
- Demonstrate the influence of soil structure on the soil water characteristics of a soil
- Derive soil moisture characteristic curves for a variety of soil
- Relationship between applied suction and suction attained in a sand table

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Issue: 2 URL: http://www.armfield.co.uk/fel4 Applications

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Description

The equipment consists of a freestanding circular tank filled with saturated sand (not supplied).

Equilibrated soil samples placed on the sand are then subjected to a known variable suction range of 0-800mm of water.

The suction is applied by means of a buried porous pipe and an associated sliding control chamber. In order to maintain the suction an uninterrupted low volume water supply is required.

A lightweight cover is provided to prevent evaporative water loss during experiments and the table is large enough to permit the simultaneous evaluation of several samples.

Requirements	Scale	
1Ph COLD	Å	

Cold water supply: Connection to a permanent cold water supply **Drain:** Suitable laboratory drain required



Overall dimensions

Length	0.5m	
Width	0.4m	
Height	0.5m	
Packed and crated shipping specifications		
Volume	0.7m ³	
Gross weight	100Kg	





Ordering specification

Soil Moisture Suction Sand Table comprising:

- ▶ 300mm diameter, with sliding suction control chamber giving tension range 0-800mm of water (using sandy-loam)
- Complete with three soil sample retaining rings (80mm diameter)
- Complete with instruction manual

Ordering codes

► FEL4



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Knowledge base

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Irrigation Water Management / FE series



Demonstration Infiltration Apparatus – FEL5-MKII

A simple but effective laboratory demonstration of infiltration processes, which are fundamental to any form of irrigation study.

The FEL5-MKII Demonstration Infiltration Apparatus comprises of three transparent cylinders in which soil samples are placed. Water poured onto the soil surface can then be observed as it infiltrates the sample.

Description

The Armfield Demonstration Infiltration Apparatus provides a simple but effective laboratory demonstration of infiltration processes, which are fundamental to any form of irrigation.

Each cylinder features a graduated scale so that observations may be quantified. Each cylinder incorporates an air breather and a perforated base plate to facilitate drainage without undue soil loss.



Experimental content

- Demonstration of the effect of crusting on infiltration
- Understand the effects of soil texture and structure on infiltration
- Understand the effects of existing soil moisture conditions on infiltration
- Demonstration of relationship between soil type and infiltration and penetration rates
- Demonstration of the relationship between soil particle size and infiltration
- The effect of organic matter content on infiltration and penetration rate
- The effect of non-homogeneous soil strata on infiltration and penetration rates
- ▶ The effect of moisture content on infiltration and penetration rates
- ► The effect of straw mulch on infiltration rate

Overall dimensions

Length	0.50m	
Width	0.40m	
Height	0.90m	
Packed and crated shipping specifications		
Volume	0.5m ³	
Gross weight	70Ka	

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Requirements

Fand

Scale

Cold water supply

Ordering specification

Demonstration Infiltration Apparatus comprising:

- Three graduated perspex cylinders, resting on a permeable support screen, into which soil samples are placed
- Complete apparatus is supported by a metal stand
- Can be bench mounted
- Complete with instruction manual

Ordering codes

FEL5

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LYSIMETER armfield

Irrigation Water Management / FE series

Demonstration Lysimeter – FEL6



The Armfield FEL6 lysimeter consists of three 300mm diameter containers in which a variety of crop types can be grown in any soil type.

Each container can then in turn be placed on a hydraulically mounted plate, which is used to monitor system weight changes arising from evapotranspiration, precipitation and drainage.

Despite its simplicity, the apparatus has a high degree of sensitivity and may be used for student project work as well as for demonstration purposes.

Requirements	Scale
	ĨŤ
Cold water supply	

Experimental content

- Study of the evapotranspiration measurement by use of a lysimeter
- Study of a lysimeter operation
- Determine lysimeter sensitivity to gains and losses in weight at different manometer angles and to relate this to gains or losses in water
- Demonstrate the components of the soil-plant-water system using the lysimeter
- Measuring the variations of water loss or gain from the soil and plant due to evapotranspiration, precipitation and drainage processes
- Demonstrate the principles of relationships between reference crop ► evapotranspiration, maximum and actual evapotranspiration
- Determination of the plants water usage ►
- Determine changes in diurnal evapotranspiration as measured ► by the lysimeter

Overall dimensions

Length	0.48m		
Width	0.43m		
Height	1.66m		
Packed and crated shipping specifications			
Volume	0.6m ³		
Gross weight	100Kg		

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FEL6 - Bubble level

FEL6 - Accessories and manual

Ordering specification

Demonstration Lysimeter Apparatus comprising:

- Base and inner disc to support soil filled container and plant, resting on a hydraulic sensing device located in the base that is connected to a graduated water column mounted above the lysimeter
- Complete with spare plant containers
- Complete with instruction manual

Ordering codes

► FEL6

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The FEL10 Drain Permeameter apparatus provides the students with a way of studying the interactions between drains, soils and filters in the laboratory.

The apparatus consists of a constant head permeator which allows the study of various combinations of soils, filters and drain types. Changes in permeability with time can be estimated by measuring the rate of drainage of water from the permeator.

The part of the soil/drain system which is changing its permeability can be inferred from the series of piezometer tubes which are connected to the cylinder of the permeator.

Description

The Armfield Drain Permeameter is suited for use both as a teaching and demonstration tool and for laboratory testing and research. The equipment consists of a 100mm diameter transparent column. which may be filled with any soil type. A removable base section is provided into which the filter material to be investigated is placed.

Water is added to the column under a constant head and permeating water and soil is collected at the base. The discharge from the drain can be monitored to assess the efficiency of the filter material.

The apparatus is supported on a sturdy metal frame and may be conveniently placed on a laboratory bench close to a water supply and drain.



Experimental content

- Determine relative efficiencies of drain filter materials
- Select optimum filter/soil combinations
- Demonstration of Darcy's Law and to illustrate the various concepts in the Darcy equation: water potential, hydraulic conductivity and flow rate
- To investigate the influence of drain slot size variation of drain ▶ sediment yield and susceptibility to blocking
- Investigation of the dynamics of a gravel envelope

Overall dimensions

Length	0.40m			
Width	0.35m			
Height	1.19m			
Packed and crated shipping specifications				
Volume	0.5 m ³			
Gross Weight	80kg			

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FEL10 - Safe and easy working height

Requirements

Scale

Cold water supply

Ordering specification

Drain Permeameter comprising:

- Acrylic column, 100mm diameter supported on a metal stand
- Removable test section is provided at the base of the column ► to house the filter medium to be tested
- May be bench mounted
- Complete with instruction manual

Ordering codes

► FEL10

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