Hydraulics Research
Wallingford

The structure of flow in open channels - A literature search

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SUMMARY

This report presents the result of a literature search into flow in open channels with particular interest in Flood Channels.

The search is presented in the form of three files:

- a card index file developed on the Apricot micro computer associated with the Flood Channel Facility which indicates the source of the publication and gives details of any experimental facility.

- a precis of each paper or book accessed indicating the channel type studied, the aims of the paper, conclusions drawn and the nature of the instruments used in the study.

- details of the channels studied in previous research into flow interaction, secondary flow, turbulence, momentum transfer etc, unified in S.l units. Three relevant dimensionless parameters are also presented.

CONTENTS

1 HISTORICAL RESUMÉ

The requirement for a literature search on the structure of flow in compound open channels was identified in the research strategy formulated by the SERC working party on Flood Channels and sponsored as a research objective by the Ministry of Agriculture, Fisheries and Food at Hydraulics Research Ltd. The importance of designing efficient flood alleviation schemes and understanding the flow processes within these channels is indicated by the fact that, an average of £73 m per annum has been spent by Water Authorities in England and Wales over the past six years on land drainage and flood protection works.

Historically researchers such as Hegly (1936) have studied flow velocities in prototype compound channels and compared the results with similar measurements from scale models of the channel. The influence of interactive flows in compound channels upon stage has been illustrated in experimental and prototype channels by Zheleznyakov (1965). Similarly the influence of compound meandering channels upon stage has been studied by USWES (1956), Smith (1978) and Treske (1980).

These studies all present the effect of the interaction rather than understanding the physical process of flow interaction and its expression in secondary flow, shear stress distributions, turbulence intensities and momentum transfer.

In recent years, increasing use has been made of compound channels for flood alleviation schemes. One problem in assessing the dimensions of these channels is that different methods of calculating the conveyance produce results varying by as much as 30%, Samuels (1984). Similarly, comparing momentum and kinetic energy flux values for different conveyance calculation methods can produce greater variation, indicating that though the overall discharge in a compound channel may be correct the distribution is incorrect, Wormleaton (1982, 1984). Knight (1984) investigated the effect of channel subdivision along apparent shear interfaces on stage discharge relationships and identified the importance of lateral transfer of momentum between flood plain and main channel.

Another problem in defining the conveyance of a cross-section is how to account for the different roughnesses across the section. Turbulent losses will be higher through scrub growing on the banks of a channel than at the bed of a smooth channel. The fluid mechanics of these flows is complex. Pasche (1983, 1985) is attempting to derive a universal resistance law in order to be able to calculate the apparent shear stress due to the bank vegetation and so determine the conveyance of the main channel.

Consequently, an alternative to such laboratory and field experiments is to construct a mathematical model of the main features of the flow, particularly the effects of drag exerted on the channel flow by the slower moving water on the flood plain, Vreugdenhil and Wijbenga (1982). However, uncertainties associated with current one dimensional mathematical models and also physical models in these situations still exist, Tagg (1985).

Further work is, therefore, needed to quantify the range of error in conveyance of various simplifying assumptions commonly employed and the effects of such errors on simulated water levels such that efficient flood alleviation schemes can be designed in the future.

2 ACKNOWLEDGEMENTS

This work was sponsored by the Ministry of Agriculture, Fisheries and Food, as part of the strategic research commission, number 13A, of Hydraulics Research.

The author carried out the work in Dr P G Samuels section in the River Engineering Department at Hydraulics Research, headed by Dr W R White.

The author is grateful to Dr D A Ervine of Glasgow University, Dr D W Knight of Birmingham University, Dr W R C Myers of Ulster University, Dr R H J Sellin of Bristol University and Dr P R Wormleaton of Queen Mary College, London University for their help in compiling the references in the literature search.

3 CARD INDEX OF PAPERS

The card index was compiled on the Apricot Xi-10 micro computer associated with the Flood Channel Facility at Hydraulics Research, using CARDBOX-PLUS, Version 3 as supplied by Business Simulations Ltd.

The field captions used in the card index are detailed below:

Author	self explanatory
Title	self explanatory
Pub'n	publication (see Abbreviation of Publications)
Data	form of data presentation, graphical notation
Key words	self explanatory
Channel type	channel types are defined as experimental, prototypical, theoretical, simple, compound, smooth, rough, bend, duct or pipe. Due to the restricted space available on the card format used, abbreviations of the above channel descriptions are frequently necessary.
FL, FW, FD	flume length, width and depth
CL, CW, CD	channel length, width and depth
FCS	flume or channel slope, eg 2(-3) represents a slope of 0.002
Q	discharge
INST	instruments used in experimental work

Abbreviation of Publications

AMER	American
ANN	Annual
ASME	American Society of Mechanical Engineers
ASP	Aspects
CH, CHAN	Channel
CIV	Civil
CONF	Conference
CONG	Congress
CONST	Construction
CONT	Control
DEPT	Department
D, DIV	Division
DPRI	Disaster Prevention Research Institute
ELEM	Elements
EM	Engineering Mechanics
ENG	Engineering
EXP	Experimental
FIN	Finite
FOUND	Foundation
GEOL	Geological
GEOPHYS	Geophysical
HYD, HYDR	Hydraulics
IAHR	International Association Hydraulic Research
ID	Irrigation and Drainage
IHW	Institut for Hydromechanik and Wasserwirtschaft
INST	Institute
INT	International

IWES	Institute of Water Engineers and Scientists
J	Journal
JICE	Journal Institute of Civil Engineers
JSCE	Japan Society of Civil Engineers
MEAS	Measurements
MECH	Mechanics
MIN	Ministry
MOD	Modelling
NACA	National Advisory Committee for Aeronautics
NO	Number
PASCE	Proceedings American Society of Civil Engineers
PICE	Proceedings Institute of Civil Engineers
PROC	Proceedings
REF	Refined
REG	Regional
RES	Research
REV	Review
SED	Sediment
SOC	Society
STN	Station
STR	Structures
SYMP	Symposium
TASCE	Transactions American Society of Civil Engineers
TASME	Transactions American Society of Mechanical Engineers
TECH	Technical
TN	Technical note

TRANS	Transactions
TUR	Turbulence
UKAEA	United Kingdom Atomic Energy Authority
UNIV	University
US	United States
USWES	United States Waterways Experimental Station
VOL	Volume
WH, WAT HAR	Waterways and Harbours

A copy of each of the papers detailed in the card index is kept on the Flood Channel Facility. Books referred to are kept in the library at Hydraulics Research Ltd. The author accepts that the literature search does not give a comprehensive coverage of papers and books relating to the structure of flow in open channels. The literature search will be updated as further material becomes available in recognition of this fact.

AUTHOR ABRAHAM G, HOLLEY E R, SIEMONS J

PUB`N DELFT PUBLICATION NO 102, APRIL 1972

TITLE SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS

DATA MIXING DISTANCE, ASPECT RATIO, CONCENTRATION DISTRIBUTION, TRANSVERSE DISTANCE

KEY WORDS ANALYSIS, TRANSVERSE DIFFUSION

CHANNEL TYPE THEORY, PROTO

FL
FW
FD

CL 1000 M
CW 75 M
CD

FCS
Q 250 CUMECS
INST

AUTHOR ADACHI S

PUB`N KYOTO UNIV., DISASTER PREVENTION RES INST, 69, 1969

TITLE ON THE ARTIFICIAL STRIP ROUGHNESS

DATA FRICTION FACTOR, REL ROUGHNESS SPACING & FLOW DEPTH, PRESSURE DRAG COEF, GROOVE ROUGHNESS

KEY WORDS STRIP ROUGHNESS, DRAG COEFFICIENT, FRICTION FACTOR

CHANNEL TYPE EXP, SIMP, RGH

FL 14.4 M
FW 0.20 M
FD 0.30 M

CL 14.4 M
CW 0.20 M
CD 0.30 M

FCS 2(-3)
Q 0.15 - 15 LITRES/SEC
INST PIEZOMETRIC TAPPINGS

AUTHOR ADACHI S

PUB`N TRANS. JSCE, VOL 81, MAY, 1962

TITLE THE EFFECTS OF SIDE WALLS IN RECTANGANGULAR CROSS SECTIONAL CHANNEL (JAPANESE + ENG. SUMMARY)

DATA ROUGHNESS HEIGHT/DEPTH RATIO, REYNOLDS NO, FLOW/SHEAR VEL RATIO, ASPECT RATIO, SHEAR STRESS INDEX

KEY WORDS SIDE WALLS, SHEAR STRESS , TURBULENCE, RECTANGULAR CHANNEL

CHANNEL TYPE THRY, EXP, SIMP, SMTH, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

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................................................................................
.AUTHOR AHMED S, BRUNDRETT E                             .PUB`N J HEAT MASS    .
..........................................................TRANSFER,  VOL 14,   .
.TITLE CHARACTERISTIC LENGTHS FOR   NON CIRCULAR DUCTS   .JANUARY, 1971        .
.                                                        .                     .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO  , NUSSELT NO,    .KEY WORDS CHARACTERISTIC .
.LENGTH SCALE,  VEL   PROFILE                        .LENGTH,   REYNOLDS NO.,  .
......................................................NON CIRCULAR DUCTS       .
.CHANNEL TYPE EXP, THRY, SIMP, DUCT                  .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR ALFRINK B J                                      .PUB`N DELFT          .
..........................................................HYDRAULICS           .
.TITLE VALUE OF REFINED TURBULENCE MODELLING FOR THE     .LABORATORY, 268,     .
.FLOW OVER A TRENCH                                      .JUNE 1982            .
................................................................................
.DATA DEPTH, FLOW VELOCITY, TURBULENCE ENERGY, EDDY  .KEY WORDS TURBULENCE     .
.VISCOSITY                                           .MODELLING, FLOW, TRENCH  .
......................................................                         .
.CHANNEL TYPE THEORY, EXP, COMP, SMOOTH              .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR ALLEN J, ULLAH M I                               .PUB`N PICE, 1967,    .
..........................................................36, PAPER NO 6946,   .
.TITLE THE FLOW OF WATER THROUGH SMOOTH OPEN CHANNELS OF .DECEMBER             .
.NARROW RECT & T SHAPED CROSS SECTIONS                   .                     .
................................................................................
.DATA VELOCITY, DEPTH, WIDTH/DEPTH RATIO, FRICTION   .KEY WORDS FLOW, SMOOTH   .
.FACTOR, REYNOLDS NO                                 .,OPEN CHANNEL,           .
......................................................RECTANGULAR, T - SHAPED  .
.CHANNEL TYPE EXP, SIMPLE, COMP, SMOOTH              .                         .
................................................................................
.FL 20 FT                .FW 2 IN                  .FD 15 IN                   .
................................................................................
.CL 20 FT                .CW 1 IN                  .CD 11 IN                   .
................................................................................
.FCS                 .Q                    .INST POINT GAUGE, MIN CURRENT      .
.                    .                     .METER, VOLUMETRIC TANK, FLOATS     .
................................................................................
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AUTHOR ALLEN J, CHEE S P

PUB`N PICE, 1962, VOL 23, 1

TITLE THE RESISTANCE TO THE FLOW OF WATER ROUND A SMOOTH CIRCULAR BEND IN AN OPEN CHANNEL

DATA CHANNEL LENGTH RATIO, DEPTH/WIDTH RATIO, REYNOLDS, VELOCITY HEAD

KEY WORDS RESISTANCE, BEND, OPEN CHANNEL

CHANNEL TYPE EXP, SIMPLE, SMOOTH, BEND

FL 20.8, 24 FT

FW 0.479 FT

FD

CL 4.62, 16.83 FT

CW 0.16, 0.479 FT

CD

FCS 0 - 1.22(-3)

Q

INST POINT GAUGE, VOLUMETRIC TANK, ADJ. WEIR

AUTHOR VAN ALPHEN J S L J, BLOKS P M, HOEKSTRA P

PUB`N EARTH SURFACE PROCESSES AND LANDFORMS, 9, DEC, 1984

TITLE FLOW AND GRAINSIZE PATTERN IN A SHARPLY CURVED RIVER BEND

DATA ISOVELS, FLOW DIRECTION, FLOW VELOCITY, BED SHEAR STRESS, DEPTH

KEY WORDS SECONDARY CIRCULATION, BED SHEAR STRESS, MEANDER BEND

CHANNEL TYPE PROTO, SIMPLE, ROUGH, BEND

FL

FW

FD

CL 30 M

CW 8 M

CD 0.6 M

FCS

Q 1.25 CUMECS

INST CURRENT METER, ELECTRO MAGNETIC CURRENT METER

AUTHOR AMERICAN SOCIETY OF CIVIL ENGINEERS

PUB`N PASCE, J HYD D, VOL 89, HY2, MARCH, 1963

TITLE FRICTION FACTORS IN OPEN CHANNELS

DATA LITERATURE REVIEW

KEY WORDS FRICTION FACTORS, OPEN CHANNELS, BOUNDARY LAYER

CHANNEL TYPE EXPERIMENTAL, PROTOTYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR ANANYAN A K

PUB`N ISRAEL PROGRAM SCIENTIFIC TRANS, JERUSALEM, 1965

TITLE FLUID FLOW IN BENDS OF CONDUITS

DATA TURBULENT FLOW, TRANSVERSE CIRCULATION, CONDUIT, BEND

KEY WORDS SECONDARY FLOW, BEND

CHANNEL TYPE

FL FW FD

CL CW CD

FCS Q INST

AUTHOR ANDREOPOULOS J, DURST F, ZARIC Z, JOVANOVIC J

PUB`N EXPERIMENTS IN FLUIDS, 2, 1984

TITLE INFLUENCE OF REYNOLDS NUMBER ON CHARACTERISTICS OF TURBULENT WALL BOUNDARY LAYERS

DATA VELOCITY PROFILE & FLUCTUATION, AXIAL & CROSS FLOW FLUCTUATIONS

KEY WORDS TURBULENCE INTENSITY, REYNOLDS SHEAR STRESS

CHANNEL TYPE EXP, SMOOTH, DUCT

FL FW FD

CL CW CD

FCS Q AIR INST HOT WIRE ANEMOMETER

AUTHOR ANWAR H O

PUB`N PASCE, J ENG MECH, VOL 112, 1, JANUARY, 1986

TITLE LOW REYNOLDS NUMBER TURBULENT FLOW IN LABORATORY FLUME

DATA SKIN FRICTION, REYNOLDS, SHAPE FACTOR, TURBULENCE INT, AUTO CORRELATION, ENERGY SPECTRA

KEY WORDS TURBULENCE INTENSITIES, ENERGY SPECTRA, REYNOLDS

CHANNEL TYPE EXP, SIMPLE, ROUGH

FL 100 M FW 1.50 M FD 0.78 M

CL 100 M CW 1.50 M CD 0.78 M

FCS Q INST MINIATURE CURRENT METER, TWO COMPONENT ULTRASONIC CURRENT METER

.AUTHOR ANWAR H O, ATKINS R

.PUB`N EUROMECH 156, ISTANBUL, JULY, 1982

.TITLE TURBULENT STRUCTURE IN AN OPEN CHANNEL

.DATA AUTOCORRELATION, EDDY DIMENSION, FREQUENCY, DURATION, ENERGY SPECTRA

.KEY WORDS TURBULENCE, OPEN CHANNEL

.CHANNEL TYPE EXP, SIMPLE, SMOOTH

.FL 27 M .FW 0.6 M .FD 0.4 M

.CL 27 M .CW 0.6 M .CD 0.40 M

.FCS .Q

.INST ELECTRO MAGNETIC C.M., MINIATURE C.M., PRESTON TUBE, WAVE PROBE

.AUTHOR ANWAR H O

.PUB`N PASCE, J HYD D, VOL 112, 8, AUGUST, 1986

.TITLE TURBULENT STRUCTURE IN A RIVER BEND

.DATA ISOVELS, REYNOLDS SHEAR STRESS, TURBULENT KINETIC ENERGY & TURBULENT PRODUCTION

.KEY WORDS TURBULENCE, BEND, REYNOLDS SHEAR STRESS

.CHANNEL TYPE PROTO, SIMP, RGH, BEND

.FL .FW .FD

.CL 12.5 M .CW 3 M .CD

.FCS .Q

.INST ELECTRO - MAGNETIC CURRENT METER

.AUTHOR APMANN R P

.PUB`N PASCE, J HYD D, VOL 98, HY5, MAY, 1972

.TITLE FLOW PROCESSES IN OPEN CHANNEL BENDS

.DATA MAXIMUM SHEAR, CURVATURE RATIO, DEPTH, WIDTH

.KEY WORDS BOUNDARY SHEAR STRESS, BENDS, CHANNEL DEFORMATION

.CHANNEL TYPE THRY, EXP, PROTO, SIMP, RGH

.FL .FW .FD

.CL 11563 FT .CW .CD

.FCS 1(-3) .Q .INST

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................................................................................
.AUTHOR ARANOVITCH E                                     .PUB`N J HEAT         .
..........................................................TRANSFER, NO 70,     .
.TITLE A METHOD FOR DETERMINATION   OF LOCAL TURBULENT   .FEBRUARY, 1971       .
.FRICT. FACTOR & HEAT TRANSFER COEFF. IN GEN. GEOM.      .                     .
................................................................................
.DATA ANNULAR & CLUSTER GEOMETRY,   FRICTION FACTOR, .KEY WORDS FRICTION       .
.WALL SHEAR STRESS , HEAT TRANSFER COEFF., VEL. DIST..FACTOR, HEAT TRANSFER    .
......................................................COEFF.                   .
.CHANNEL TYPE THRY, EXP, DUCT                        .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR ASANO T, HASHIMOTO H, FUJITA K                   .PUB`N PROC 21 ST     .
..........................................................CONG., IAHR,         .
.TITLE CHARACTERISTICS OF VARIATION OF MANNINGS          .MELBOURNE, VOL 6,    .
.ROUGHNESS COEFF IN A COMPOUND CROSS SECTION             .AUG, 1985            .
................................................................................
.DATA REL DEPTH, NORMALIZED ROUGHNESS COEFF., ASPECT .KEY WORDS MANNINGS N,    .
.RATIO, MIXING WIDTH, TURBULENCE INTENSITY           .COMPOUND CHANNEL, FLOW   .
......................................................INTERACTION              .
.CHANNEL TYPE EXP, THRY, COMP, SMTH                  .                         .
................................................................................
.FL 50 M                 .FW 3 M                   .FD                         .
................................................................................
.CL 30 M                 .CW 90, 240 CM            .CD 3.1, 12.1 CM            .
................................................................................
.FCS 0.94 - 1.07(-3) .Q 5.3 - 612.9 L/S    .INST MIN CURRENT METER, POINT      .
.                    .                     .GAUGE                              .
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.AUTHOR ATKINS R                                         .PUB`N HYDRAULICS     .
..........................................................RESEARCH STATION,    .
.TITLE TURBULENCE MEASUREMENTS USING A SMALL ELECTRO     .INT 196, APRIL, 1980 .
.MAGNETIC CURRENT METER IN OPEN CHANNELS                 .                     .
................................................................................
.DATA TURBULENCE INTENSITY, REYNOLDS SHEAR STRESS,   .KEY WORDS TURBULENCE,    .
.RELATIVE DEPYH                                      .ELECTRO MAGNETIC CURRENT .
......................................................METER                    .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH                    .                         .
................................................................................
.FL 27 M                 .FW 0.6 M                 .FD 0.4 M                   .
................................................................................
.CL 27 M                 .CW 0.6 M                 .CD 0.4 M                   .
................................................................................
.FCS                 .Q                    .INST ELECTRO MAGNETIC C.M., MINIATU.
.                    .                     .RE C.M., PRESTON TUBE, WAVE PROBE  .
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AUTHOR BAIRD J I, ERVINE D A

PUB`N PROC 1ST INT CONF CHANNELS & CHAN CONT STRUCT, 1984

TITLE RESISTANCE TO FLOW IN CHANNELS WITH OVERBANK FLOODPLAIN FLOW

DATA FRICTION FACTORS, SHEAR STRESS, DEPTH, VELOCITY,

KEY WORDS COMPOUND CHANNEL, SHEAR STRESS, RESISTANCE

CHANNEL TYPE EXP, COMP, SMTH

FL 8.5 M
FW 0.8 M
FD 0.3 M

CL 8.5 M
CW 0.2, 0.6 M
CD 0.052, 0.152 M

FCS 3.33 - 10(-4)
Q 0 - 0.06 CUMECS
INST POINT GAUGE, PITOT TUBE, PRESTON TUBE, PRESSURE TRANSDUCER

AUTHOR BARISHNIKOV N B, IVANOV G V, SOKOLOV Y N

PUB`N IAHR, 1971, PARIS, PROC 14 TH CONGRESS

TITLE ROLE OF FLOODPLAIN IN FLOOD DISCHARGE OF A RIVER CHANNEL

DATA STAGE, DISCHARGE, VELOCITY RATIOS, FLOW INTERSECTION ANGLE

KEY WORDS FLOOD PLAIN, FLOOD DISCHARGE

CHANNEL TYPE EXP, PROT, COMP, SMTH, RGH

FL 10 M
FW 2.4 M
FD

CL 10 M
CW 0.4 M
CD 0.05 M

FCS
Q 0 - 90 LITRES/SEC
INST

AUTHOR BARR D I H, DAS M M

PUB`N PROC. ICE, PT 2, 1986, 81, PAPER 8955, SEPT., 1986

TITLE DIRECT SOLUTIONS FOR NORMAL DEPTH USING THE MANNING EQUATION

DATA NON DIMENSIONAL NORMAL DEPTH, CHANNEL SIDE SLOPE

KEY WORDS NORMAL DEPTH, MANNINGS N

CHANNEL TYPE THRY, EXP, SIMP, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

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................................................................................
.AUTHOR BARR D I H                                       .PUB`N J IWES, VOL    .
.........................................................32, NO 1,  JAN, 1978 .
.TITLE A NEW APPROACH TO FULLY      GRAPHICAL            .                     .
.(DIMENSIONAL) SOLUTION   OF THE COLEBROOK-WHITE FUNCTION.                     .
................................................................................
.DATA DIMENSIONAL COLEBROOK-WHITE   FUNCTION PLOT,   .KEY WORDS RESISTANCE,    .
.NON DIMENSIONAL     ACKERS RESISTANCE DIAGRAM       .COLEBROOK -  WHITE       .
......................................................FUNCTION                 .
.CHANNEL TYPE THEORY, EXPERIMENTAL, ROUGH            .                         .
................................................................................
.FL                       .FW                         .FD                      .
................................................................................
.CL                       .CW                         .CD                      .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR BARRAGE A                                        .PUB`N IHW,           .
.........................................................TECHNISCHE            .
.TITLE RESEARCH INTO TURBULENCE AND SUSPENDED SEDIMENT   .HOCHSCHULE, ZURICH,  .
.IN RIVERS ( SWISS GERMAN )                              .R 15 - 79, 1979      .
................................................................................
.DATA VELOCITY PROFILE, TURBULENCE INTENSITY,        .KEY WORDS TURBULENCE     .
.ISOVELS, ENERGY DISSIPATION, AUTOCORRELATION        .                         .
......................................................                         .
.CHANNEL TYPE PROTO, SIMPLE, ROUGH                   .                         .
................................................................................
.FL                       .FW                         .FD                      .
................................................................................
.CL                       .CW 14.0 M                  .CD                      .
................................................................................
.FCS 2.6(-3)         .Q 57.5 CUMECS        .INST PRESSURE PROBE                .
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.AUTHOR BATHURST J C, THORNE C R, HEY R D                .PUB`N PASCE, J HYD   .
.........................................................D, VOL 105, HY10,     .
.TITLE SECONDARY FLOW AND SHEAR STRESS AT RIVER BENDS    .OCTOBER, 1979        .
.                                                        .                     .
................................................................................
.DATA PRIMARY VELOCITY, SECONDARY VELOCITY, ISOVELS, .KEY WORDS SECONDARY      .
.BOUNDARY SHEAR STRESS, REYNOLDS                     .FLOW, SHEAR STRESS,      .
......................................................RIVER BENDS              .
.CHANNEL TYPE PROTO, SIMPLE, BEND, ROUGH             .                         .
................................................................................
.FL                       .FW                         .FD                      .
................................................................................
.CL                       .CW 8.4, 26.2 M             .CD                      .
................................................................................
.FCS 0.47 - 2.9(-3)  .Q 0.92 - 15.48       .INST ELECTROMAGNETIC FLOWMETER     .
.                    .CUMECS               .                                   .
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.AUTHOR BATHURST J C                                     .PUB`N PASCE, J HYD    .
..........................................................D, VOL 104, HY12,     .
.TITLE FLOW RESISTANCE OF LARGE SCALE ROUGHNESS          .DEC, 1978             .
.                                                        .                      .
.................................................................................
.DATA ROUGHNESS CONC., RELATIVE ROUGHNESS, VELOCITY, .KEY WORDS RESISTANCE,     .
.CHANNEL SHAPE, SHEAR RATIO                          .LARGE SCALE ROUGHNESS     .
......................................................                          .
.CHANNEL TYPE PROTO, ROUGH, SIMPLE                   .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL 100 M                .CW 14.9, 32.9 M          .CD                          .
.................................................................................
.FCS 0.80 - 1.74(-2) .Q 0.9 - 7.2 CUMECS   .INST CURRENT METER                  .
.                    .                     .                                    .
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.AUTHOR BATHURST J C, LI R M, SIMONS D B                 .PUB`N PASCE, J HYD    .
..........................................................D, VOL 107, HY12,     .
.TITLE RESISTANCE EQUATION FOR LARGE SCALE ROUGHNESS     .DECEMBER, 1981        .
.                                                        .                      .
.................................................................................
.DATA ROUGHNESS CONCENTRATION, RELATIVE SUBMERGENCE, .KEY WORDS RESISTANCE      .
.FROUDE, RESISTANCE FUNCTION, SEDIMENT SIZE          .EQUATION, LARGE SCALE     .
......................................................ROUGHNESS                 .
.CHANNEL TYPE EXP, THRY, SIMP, RGH                   .                          .
.................................................................................
.FL 9.54 M               .FW 1.168 M               .FD                          .
.................................................................................
.CL 9.54 M               .CW 1.168 M               .CD                          .
.................................................................................
.FCS 2 - 8(-2)       .Q 0.00143 - 0.0802   .INST POINT GAUGE                    .
.                    .CUMECS               .                                    .
.................................................................................


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.AUTHOR BATHURST J C, THORNE C R, HEY R D                .PUB`N PASCE, J HYD    .
..........................................................D, VOL107, HY5, MAY,  .
.TITLE SECONDARY FLOW AND SHEAR STRESS AT RIVER BENDS    .1981                  .
.(CLOSURE)                                               .                      .
.................................................................................
.DATA                                                .KEY WORDS SECONDARY       .
.                                                    .FLOW, SHEAR STRESS, BEND  .
......................................................                          .
.CHANNEL TYPE PROTO, ROUGH, BEND                     .                          .
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.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST                                .
.                    .                     .                                    .
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AUTHOR BATHURST J C, THORNE C R, HEY R D

PUB`N NATURE, 269, OCTOBER, 1977

TITLE DIRECT MEASUREMENTS OF SECONDARY CURRENTS IN RIVER BENDS

DATA PRIMARY & SECONDARY VELOCITIES, ISOVELS

KEY WORDS SECONDARY FLOW, RIVER BENDS, MEASUREMENT

CHANNEL TYPE PROTO, SIMP, RGH, BEND

FL	FW	FD
CL	CW 8, 21 M	CD
FCS	Q 1.1 - 9 CUMECS	INST ELECTROMAGNETIC CURRENT METER

AUTHOR BATHURST J C

PUB`N ADJUSTMENTS OF THE ALLUVIAL SYSTEM, 1979

TITLE DISTRIBUTION OF BOUNDARY SHEAR STRESS IN RIVERS

DATA ISOVELS, BOUNDARY SHEAR STRESS RATIO, DISTANCE, REYNOLDS NO, BOUNDARY SHEAR DISTRIBUTION

KEY WORDS BOUNDARY SHEAR STRESS, RIVERS

CHANNEL TYPE PROTO, SIMP, RGH, THRY

FL	FW	FD
CL 38, 76 M BENDS	CW 8.4, 31.9 M	CD
FCS 0.01 - 2.9(-3)	Q 0.71 - 36.76 CUMECS	INST CURRENT METER

AUTHOR BATHURST J C

PUB`N MOD. GEOMORPHOLOGICAL SYSTEMS, JOHN WILEY AND SONS LTD.

TITLE FLOW PROCESSES AND DATA PROVISION FOR CHANNEL FLOW MODELS

DATA CHANNEL FLOW, RESISTANCE, SECONDARY FLOW, COMPOUND CHANNELS, MOMENTUM EXCHANGE, MEANDERING

KEY WORDS FLOW PROCESSES, FLOW MODELS

CHANNEL TYPE THRY, EXP, PROTO, SIMP, COMP

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR BERTRAM H U

PUB`N LEICHTWEISS INSTITUT FUR WASSERBAU, NO 86, 1985

TITLE FLOW IN TRAPEZOIDAL CHANNELS WITH EXTREME BANK ROUGHNESS (GERMAN)

DATA VELOCITY, DEPTH, ROUGHNESS DISTRIBUTION, DISCHARGE RATIO, DEPTH/WIDTH RATIO, FRICTION

KEY WORDS FLOW, BANK ROUGHNESS, TRAPEZOIDAL CHANNEL

CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH

FL 12 M
FW 1.24 M
FD 0.37 M

CL 12 M
CW 0.40 M
CD 0.37 M

FCS 5 - 20(-4)
Q 0 - 80 L/S
INST POINT GAUGE, VENTURI, WEIR, PITOT TUBE, MIN CURRENT METER

AUTHOR BHOWMIK N G , DEMISSIE M

PUB`N PASCE, J HYD D, VOL 108, HY3, MARCH, 1982

TITLE CARRYING CAPACITY OF FLOOD PLAINS

DATA RETURN PERIOD, CONVEYANCE RATIOS, DEPTH, CHAINAGE, VELOCITY

KEY WORDS FIELD DATA, CONVEYANCE, FLOOD PLAINS

CHANNEL TYPE PROTO, COMPOUND

FL
FW
FD

CL
CW 200, 300 FT
CD 15, 30 FT

FCS
Q 14740 - 62655 CUSECS
INST

AUTHOR BHOWMIK N G

PUB`N GRAVEL BED RIVERS, JOHN WILEY & SONS, 1982

TITLE SHEAR STRESS DISTRIBUTION AND SECONDARY CURRENTS IN STRAIGHT OPEN CHANNELS

DATA SHEAR STRESS, MOMENTUM TRANSFER, ISOVELS, SECONDARY FLOW CELLS

KEY WORDS SHEAR STRESS, SECONDARY CURRENTS, OPEN CHANNELS

CHANNEL TYPE PROTO, EXP, SIMP, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST PITOT TUBE, PRESTON TUBE, CURRENT METER, SPRING BALANCE

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.AUTHOR BLACK R G                                        .PUB`N PASCE, J HYD   .
..........................................................D, VOL 108, HY6,     .
.TITLE MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN CHANNEL  .JUNE, 1982           .
.(DISCUSSION)                                            .                     .
................................................................................
.DATA                                                .KEY WORDS SPECIFIC       .
.                                                    .ENERGY, OPEN CHANNEL,    .
......................................................COMPOUND                 .
.CHANNEL TYPE THRY, EXP, COMP, SMTH                  .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR BLALOCK M E, STURM T W                           .PUB`N PASCE, J HYD   .
..........................................................D, VOL 107, HY6,     .
.TITLE MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN CHANNEL  .JUNE, 1981           .
.                                                        .                     .
................................................................................
.DATA SPECIFIC ENERGY, DEPTH, FROUDE, KINETIC FLUX   .KEY WORDS SPECIFIC       .
.                                                    .ENERGY, COMPOUND, OPEN   .
......................................................CHANNEL                  .
.CHANNEL TYPE THRY, EXP, COMP, SMOOTH                .                         .
................................................................................
.FL 80 FT                .FW 3.49 FT               .FD 1.5 FT                  .
................................................................................
.CL 80 FT                .CW 0.97 FT               .CD 0.533 FT                .
................................................................................
.FCS 1 - 4.5(-3)     .Q 1.64 - 1.78 CUSECS .INST PITOT TUBE, PRESSURE          .
.                    .                     .TRANSDUCER, VENTURI METER          .
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.AUTHOR BLALOCK M E, STURM T W                           .PUB`N PASCE, J HYD   .
..........................................................D, VOL 109, HY3,     .
.TITLE MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN CHANNEL  .MARCH, 1983          .
.(CLOSURE)                                               .                     .
................................................................................
.DATA                                                .KEY WORDS SPECIFIC       .
.                                                    .ENERGY, OPEN CHANNEL,    .
......................................................COMPOUND                 .
.CHANNEL TYPE THRY, EXP, COMP, SMTH                  .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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AUTHOR BLENCH T

TITLE MOBILE BED HYDRAULICS

PUB`N J HYDRAULIC RESEARCH, 8, 1970, 2

DATA SEDIMENT CONC, FLOW, FALL DIAM, STREAM POWER, BED FACTOR, DEPTH, FRICTION, REYNOLDS

KEY WORDS MOBILE BED, REGIME THEORY

CHANNEL TYPE THRY, EXP, SIMP, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR BLINCO P H, PARTHENIADES E

TITLE TURBULENCE CHARACTERISTICS IN FREE SURFACE FLOWS OVER SMOOTH AND ROUGH BOUNDARIES

PUB`N J HYDRAULIC RESEARCH, 9, 1971, 1

DATA TURBULENT INTENSITIES, DEPTH, DISTANCE

KEY WORDS TURBULENCE CHARACTERISTICS, OPEN CHANNELS

CHANNEL TYPE EXP, SIMP, SMTH, RGH

FL 24 FT	FW 12 IN	FD 18 IN
CL 24 FT	CW 12 IN	CD 18 IN
FCS 0 - 3(-2)	Q 0.033 - 0.494 CUSECS	INST HOT FILM ANEMOMETER

AUTHOR BRADBURY, DURST, LAUNDER, SCHMIDT, WHITELAW

TITLE TURBULENT SHEAR FLOWS - 4, SELECTED PAPERS, 4th INTERNATIONAL SYMPOSIUM

PUB`N SPRINGER - VERLAG, BERLIN, HEIDELBERG, 1985

DATA FREE FLOWS, BOUNDARY LAYERS, REACTING FLOWS

KEY WORDS TURBULENCE

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR BRADSHAW P

PUB`N SPRINGER - VERLAG, BERLIN, HEIDELBERG, 1976

TITLE TURBULENCE

DATA EXTERNAL & INTERNAL FLOWS, TURBULENCE & BOUYANT FLOWS, HEAT & MASS TRANSPORT

KEY WORDS TURBULENCE

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR de BRAY B G

PUB`N AERONAUTICAL RESEARCH COUNCIL, NO 3578, JULY, 1967

TITLE INVESTIGAT. INTO SPANWISE NON UNIFORMITY OF NOMINALLY 2D INCOMPRESSIBLE BOUNDARY LAYERS

DATA DIFFERENTIAL PRESSURE, DISTANCE

KEY WORDS BOUNDARY LAYER, SPANWISE NON UNIFORMITY

CHANNEL TYPE EXP, SIMP, SMTH, RGH, DUCT

FL 21 FT	FW 5 FT	FD 1, 5 FT
CL 10 FT	CW 5 FT	CD 1 FT
FCS	Q AIR	INST PRESTON TUBE, STATIC TUBE

AUTHOR BROOKS N H

PUB`N PASCE, J HYD D, VOL 89, HY3, MAY, 1963

TITLE BOUNDARY SHEAR STRESSES IN CURVED TRAPEZOIDAL CHANNELS (DISCUSSION)

DATA SHEAR STRESS ORIENTATION, BANK SHEAR STRESS

KEY WORDS BOUNDARY SHEAR STRESS, CURVED TRAPEZOIDAL CHANNELS

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

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.................................................................................
.AUTHOR BROOKS N H, SHUKRY A                             .PUB`N PASCE, J HYD    .
..........................................................D, HY3, MAY, 1963     .
.TITLE BOUNDARY SHEAR STRESSES IN CURVED TRAPEZOIDAL     .                      .
.CHANNELS (DISCUSSION)                                   .                      .
.................................................................................
.DATA BOUNDARY SHEAR, WATER SURFACE LEVEL, VELOCITY  .KEY WORDS BOUNDARY SHEAR  .
.DISTRIBUTION                                        .STRESS                    .
......................................................                          .
.CHANNEL TYPE                                        .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST                                .
.                    .                     .                                    .
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.AUTHOR BROWN K C, JOUBERT P N                           .PUB`N J FLUID         .
..........................................................MECHANICS, VOL 35,    .
.TITLE THE MEASUREMENT OF SKIN FRICTION IN TURB.         .PART 4, MARCH, 1969   .
.BOUNDARY LAYERS WITH ADVERSE PRESSURE GRADIENTS         .                      .
.................................................................................
.DATA SKIN FRICTION, VEL PROFILE,   SECONDARY FORCES .KEY WORDS SKIN FRICTION,  .
.                                                    .BOUNDARY LAYER, ADVERSE   .
......................................................PRESSURE GRADIENT         .
.CHANNEL TYPE EXP, THRY, SIMP, SMTH, DUCT            .                          .
.................................................................................
.FL                      .FW 13.5 IN               .FD 10 IN                    .
.................................................................................
.CL                      .CW 13.5 IN               .CD 10 IN                    .
.................................................................................
.FCS                 .Q AIR                .INST SHEAR STRESS METER, PRESTON    .
.                    .                     .TUBE, STATIC TUBE, PIEZOMETRIC TAPP.
.................................................................................


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.AUTHOR BROWNLIE W R                                     .PUB`N PASCE, J HYD    .
..........................................................D, VOL 107, HY1,      .
.TITLE REEXAMINATION OF NIKURADSE ROUGHNESS DATA         .JANUARY, 1981         .
.                                                        .                      .
.................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO, RESISTANCE DATA, .KEY WORDS NIKURADSE,      .
.TRANSITION FUNCTION                                 .ROUGHNESS                 .
......................................................                          .
.CHANNEL TYPE THRY, EXP, RGH, PIPE                   .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST                                .
.                    .                     .                                    .
.................................................................................
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AUTHOR BRUNDRETT E, BAINES W D

PUB`N J FLUID MECH, 1964, VOL 19, 3

TITLE THE PRODUCTION AND DIFFUSION OF VORTICITY IN DUCT FLOW

DATA KINETIC ENERGY, SECONDARY FLOW, TURBULENCE CORRELATION, DIMENSIONLESS VORTICITY

KEY WORDS VORTICITY, DUCT,

CHANNEL TYPE THRY, EXP, DUCT, SMOOTH

FL 70 FT   FW 3 IN   FD 3 IN

CL 70 FT   CW 3 IN   CD 3 IN

FCS   Q AIR   INST HOT WIRE ANEMOMETER

AUTHOR BUCHANAN R W, POSEY C J, YEN C L, HO S Y

PUB`N PASCE, J HYD D, VOL 109, HY11, NOVEMBER, 1983

TITLE DISCHARGE ASSESSMENT IN COMPOUND CHANNEL FLOW (DISCUSSION)

DATA DISCHARGE RATIO, DEPTH RATIO

KEY WORDS DISCHARGE ASSESSMENT, COMPOUND CHANNEL

CHANNEL TYPE

FL   FW   FD

CL   CW   CD

FCS   Q   INST

AUTHOR BUTLER D, ROCK S P, WEST J R

PUB`N J.I.W.E.S., 32, 3, 1978

TITLE FRICTION COEFFICIENT VARIATION WITH FLOW IN AN URBAN STREAM

DATA MANNINGS n, DISCHARGE, STAGE, CROSS SECTION, WETTED PERIMETER, AREA, LEVEL

KEY WORDS MANNINGS n

CHANNEL TYPE PROTO, SIMPLE, ROUGH

FL   FW   FD

CL 47, 91 M   CW 4, 5.5 M   CD

FCS 7.2(-3)   Q 0.05 - 4 CUMECS   INST CURRENT METER, STAFF GAUGE

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................................................................................
.AUTHOR CALLANDER R A                                    .PUB`N ANN. REV.      .
.........................................................FLUID MECH., 10,      .
.TITLE RIVER MEANDERING                                  .1978                 .
.                                                        .                     .
................................................................................
.DATA TURBULENCE, SECONDARY FLOW,   FLOW VEL., SHEAR .KEY WORDS MEANDERING,    .
.STRESS, SLOPE,    DISCHARGE, SINUOSITY, BED MATERIAL.SECONDARY    FLOW, SHEAR .
.....................................................STRESS                     .
.CHANNEL TYPE EXP, PROTO, THRY, SIMP, RGH            .                         .
................................................................................
.FL                       .FW                        .FD                       .
................................................................................
.CL                       .CW                        .CD                       .
................................................................................
.FCS                  .Q                     .INST                             .
.                     .                      .                                 .
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.AUTHOR CARLSON L N, IRVINE T F                          .PUB`N J HEAT         .
.........................................................TRANSFER, ASME,        .
.TITLE FULLY DEVELOPED PRESSURE DROP IN TRIANGULAR       .PAPER NO 60,         .
.SHAPED DUCTS                                            .NOVEMBER, 1961       .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO                   .KEY WORDS TURBULENT      .
.                                                    .PRESSURE DROP, DUCT      .
.....................................................                          .
.CHANNEL TYPE EXP, SIMP, SMTH, DUCT                  .                         .
................................................................................
.FL 144 IN                .FW 0.1516, 1.0526 IN HYD..FD                        .
................................................................................
.CL 72 IN                 .CW .1516, 1.0526 IN       .CD                       .
................................................................................
.FCS                  .Q AIR                 .INST PIEZOMETRIC TAPPINGS        .
.                     .                      .                                 .
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.AUTHOR CEBECI T, SMITH A M O                            .PUB`N ACADEMIC       .
.........................................................PRESS, 1974           .
.TITLE ANALYSIS OF TURBULENT BOUNDARY LAYERS             .                     .
.                                                        .                     .
................................................................................
.DATA CONSERVATION EQUATIONS, BOUNDARY LAYER,        .KEY WORDS TURBULENCE     .
.TURBULENT BOUNDARY LAYER                            .                         .
.....................................................                          .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                       .FW                        .FD                       .
................................................................................
.CL                       .CW                        .CD                       .
................................................................................
.FCS                  .Q                     .INST                             .
.                     .                      .                                 .
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AUTHOR CHEE S P
PUB`N 5 TH CONG. IAHR, ASIAN & PACIFIC REG. DIV., AUG, 1986
TITLE BOUNDARY SHAPE & ROUGHNESS EFFECTS ON STREAMFLOW
DATA VELOCITY COEFF., BOUNDARY SHEAR, COMPOSITE ROUGHNESS
KEY WORDS BOUNDARY SHAPE, SHEAR, ROUGHNESS
CHANNEL TYPE THRY, EXP, SIMP, COMP, RGH
FL
FW 475, 1524 MM
FD
CL
CW
CD
FCS
Q 0 - 300 L/S
INST MINIATURE CURRENT METER, E.M. CURRENT METER

AUTHOR CHIU C L, HSIUNG D E, LIN H C
PUB`N PASCE, J HYD D, VOL-104, HY8, AUGUST, 1978
TITLE THREE DIMENSIONAL OPEN CHANNEL FLOW
DATA SECONDARY FLOW, VELOCITY, DEPTH, CHAINAGE
KEY WORDS SECONDARY FLOW
CHANNEL TYPE PROTO, THEORY, SIMPLE
FL
FW
FD
CL 6000 FT
CW 65, 67 FT
CD
FCS
Q 630 - 1270 CUSECS
INST

AUTHOR CHIU C L, LIN G F
PUB`N PASCE, J HYD D, VOL 109, 11, OCTOBER, 1982
TITLE COMPUTATION OF THREE DIMENSIONAL FLOW AND SHEAR IN OPEN CHANNELS
DATA PRIMARY, SECONDARY VEL DISTRIBUTION, BOUNDARY SHEAR , MEASURED, COMPUTED
KEY WORDS COMPUTATION, THREE DIM FLOW AND SHEAR, OPEN CHANNELS
CHANNEL TYPE THRY, EXP, SIMP, BEND, SMTH
FL 102 FT
FW 6 FT
FD 0.6 FT
CL 102 FT
CW 6 FT
CD 0.6 FT
FCS
Q 10.25 CUSECS
INST PRESTON TUBE

AUTHOR CHIU C L, LIN H C, MIZUMURA K

PUB`N PASCE, J HYD D, VOL 102, HY2, FEBRUARY, 1976

TITLE SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS

DATA VELOCITY, SHEAR VELOCITY, DEPTH, DISPERSION COEFFICIENT, MANNINGS N, SECONDARY CURRENTS

KEY WORDS SIMULATION, HYDRAULIC PROCESSES, OPEN CHANNELS

CHANNEL TYPE THRY, PROTO, SIMPLE, ROUGH

FL	FW	FD
CL	CW 59.84 FT	CD
FCS	Q	INST

AUTHOR CHIU C L, HSIUNG D E

PUB`N PASCE, J HYD D, VOL 107, HY7, JULY, 1981

TITLE SECONDARY FLOW, SHEAR STRESS AND SEDIMENT TRANSPORT

DATA SHEAR STRESS, PRIMARY FLOW VELOCITY, SECONDARY FLOW, BOUNDARY SHEAR, SEDIMENT CONC

KEY WORDS SECONDARY FLOW, SHEAR STRESS, SEDIMENT CONCENTRATION

CHANNEL TYPE THRY, PROTO, SIMP, RGH

FL	FW	FD
CL 2000 FT	CW 66, 67 FT	CD
FCS	Q 630 - 1280 CUSECS	INST

AUTHOR CHIU C L, CHIOU J D

PUB`N PASCE, J HYD D, VOL 112, NO 11, NOVEMBER, 1986

TITLE STRUCTURE OF 3-D FLOW IN RECTANGULAR OPEN CHANNELS

DATA CO-ORDINATE SYSTEM, ASPECT RATIO, MANNINGS N, VELOCITY, SHEAR STRESS, SLOPE, SECONDARY FLOW

KEY WORDS OPEN CHANNEL, SECONDARY FLOW, COMPUTATION

CHANNEL TYPE THRY, EXP, SIMP, SMTH, RGH

FL	FW 2.771, 20 FT	FD
CL	CW 2.771, 20 FT	CD
FCS 5 - 38(-4)	Q 1.42 - 3581 CUSECS	INST

AUTHOR CHOUDARY U K, NARASIMHAN S
PUB`N PASCE, J HYD D, VOL 103, HY6, JUNE, 1977

TITLE FLOW IN 180 DEGREE OPEN CHANNEL RIGID BOUNDARY BENDS

DATA WATER SURFACE PROFILES, RADIAL MEAN VELOCITY, BOUNDARY SHEAR STRESS, SHEAR CONTOURS

KEY WORDS 180 DEGREE BEND, RIGID BOUNDARY

CHANNEL TYPE EXP, SIMPLE, BEND, SMOOTH

FL 24.29 M	FW 0.96 M	FD 0.25 M
CL 24.29 M	CW 0.96 M	CD 0.25 M
FCS	Q	INST PITOT TUBE, PRESTON TUBE, POINT GAUGE

AUTHOR CLAUSER F H
PUB`N J AERONAUTICAL SCIENCES, FEB, 1954

TITLE TURBULENT BOUNDARY LAYERS IN ADVERSE PRESSURE GRADIENTS

DATA TURBULENT VELOCITY PROFILES, SKIN FRICTION LAW, REYNOLDS NO., DISPLACEMENT THICKNESS

KEY WORDS TURBULENCE, BOUNDARY LAYER, PRESSURE GRADIENT

CHANNEL TYPE EXP, SIMP, SMTH, DUCT

FL 37 FT	FW 4 FT	FD 3 FT
CL 9 FT	CW 4 FT	CD 3 FT
FCS	Q AIR	INST PITOT TUBE, HOT WIRE ANEMOMETER

AUTHOR COLEBROOK C F, WHITE C M
PUB`N PROC ROYAL SOC, VOL 161, 906, AUGUST, 1937

TITLE EXPERIMENTS WITH FLUID FRICTION IN ROUGHENED PIPES

DATA RESISTANCE COEFFICIENT, REYNOLDS NUMBER, ROUGHNESS SPACING, RELATIVE PARTICLE SIZE

KEY WORDS FRICTION FACTOR, ROUGHENED PIPES

CHANNEL TYPE EXP, PIPE, ROUGH

FL 6.79 M	FW 0.0535 M DIAM	FD
CL 2.675 M	CW 0.0535 M DIAM	CD
FCS	Q AIR	INST PEIZOMETRIC TAPPINGS

AUTHOR COLEBROOK C F

PUB`N JICE, VOL 11, FEBRUARY, 1939

TITLE TURBULENT FLOW IN PIPES, WITH REF TO TRANSITION REGION BETWEEN SMOOTH & ROUGH PIPE LAWS

DATA DISCUSSION BY BLENCH, CHATLEY, ESSEX, FINNIECOME, LACEY, McDONALD, WILLIAMSON

KEY WORDS TURBULENT FLOW, PIPES

CHANNEL TYPE EXP, SMTH, RGH, PIPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR COLES D E, HIRST E A

PUB`N PROC AFOSR-IFP-STANFORD CONF, CALIFORNIA, 1968

TITLE COMPUTATION OF TURBULENT BOUNDARY LAYERS, STANFORD CONFERENCE, COMPILED DATA

DATA VEL RATIO, DEFECT VELOCITY, CLAUSER THICKNESS, FRICTION LAW, REYNOLDS, WAKE COMPONENT

KEY WORDS TURBULENT BOUNDARY LAYERS

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR CRUFF R W

PUB`N UNITED STATES GEOL SURVEY WATER SUPPLY PAPER 1592-B

TITLE CROSS CHANNEL TRANSFER OF LINEAR MOMENTUM IN SMOOTH RECTANGULAR CHANNELS

DATA DEPTH, VELOCITY, SHEAR STRESS DISTRIBUTION, WIDTH/DEPTH RATIO, APPARENT SHEAR FORCE

KEY WORDS CROSS CHANNEL TRANSFER, LINEAR MOMENTUM, RECT CHANNEL

CHANNEL TYPE EXP, SIMPLE, COMP, SMOOTH

FL 80 FT	FW 3.5 FT	FD 1.5 FT
CL 80 FT	CW 2 FT	CD 0.4 FT
FCS	Q	INST PITOT TUBE, PIEZOMETRIC TAPPINGS, POINT GAUGES

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.AUTHOR DAS B P, TOWNSEND R D                            .PUB`N PASCE, J HYD   .
..........................................................D, VOL 107,          .
.TITLE SHEAR STRESS DISTRIBUTION AT CHANNEL              .DECEMBER, 1981       .
.CONSTRICTIONS                                           .                     .
................................................................................
.DATA VELOCITY DISTRIBUTION, SHEAR DISTRIBUTION      .KEY WORDS SHEAR STRESS, .
.                                                    .CHANNEL CONSTRICTION    .
......................................................                         .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                     .                         .
................................................................................
.FL 60 FT                 .FW 7.5 FT                .FD 4 FT                   .
................................................................................
.CL 30 FT                 .CW 0.6, 5.65 FT          .CD 0.112 FT               .
................................................................................
.FCS                 .Q 1 - 1.7 CUSECS     .INST POINT GAUGE, MINIATURE        .
.                    .                     .CURRENT METER, BED PROBE           .
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.AUTHOR DAVIDIAN J, CAHAL D I                            .PUB`N US GEOLOGICAL  .
..........................................................SURVEY PAPER 475-C,  .
.TITLE DISTRIBUTION OF SHEAR IN RECTANGULAR CHANNELS     .ART 113, 1963        .
.                                                        .                     .
................................................................................
.DATA FROUDE, SHEAR RATIO, ASPECT RATIO, SHEAR       .KEY WORDS BOUNDARY      .
.DISTRIBUTION                                        .SHEAR, ASPECT RATIO     .
......................................................                         .
.CHANNEL TYPE EXP, SIMP, SMTH                        .                         .
................................................................................
.FL 140 FT                .FW 18 IN                 .FD                        .
................................................................................
.CL 140 FT                .CW 18 IN                 .CD                        .
................................................................................
.FCS                 .Q                    .INST PRESTON TUBE                  .
.                    .                     .                                   .
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.AUTHOR DAVIES S J, WHITE C M                            .PUB`N PROC ROYAL     .
..........................................................SOC, VOL 3, 2,       .
.TITLE AN EXPERIMENTAL STUDY OF THE FLOW OF WATER IN     .FEBRUARY, 1923       .
.PIPES OF RECTANGULAR SECTION                            .                     .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS NUMBER, LENGTH/DEPTH .KEY WORDS FLOW,         .
.RATIO                                               .RECTANGULAR PIPES,      .
......................................................FRICTION, REYNOLDS NO   .
.CHANNEL TYPE EXP, PIPE, SMTH                        .                         .
................................................................................
.FL                       .FW 0.0254 M              .FD 1.5, 6.8 -4 M          .
................................................................................
.CL 3.81 CM               .CW 0.0254 M              .CD 1.5, 6.8 -4 M          .
................................................................................
.FCS                 .Q 2.596 - 8.308      .INST VOLUMETRIC TANK, PEIZOMETRIC  .
.                    .GM/SEC               .TAPPINGS, THERMOMETER              .
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AUTHOR DAVIES S J, WHITE C M
PUB'N ENGINEERING, JULY, 1929
TITLE A REVIEW OF FLOW IN PIPES AND CHANNELS

DATA FRICTION FACTOR, REYNOLDS NO
KEY WORDS PIPE, CHANNEL, FRICTION FACTOR, REYNOLDS NO.
CHANNEL TYPE EXP, THRY, SIMP, SMTH, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR DELLEUR J W, TOEBES G H, UDEOZO B C
PUB'N IAHR, 1967, FORT COLLINS, PROC 12 TH CONGRESS
TITLE UNIFORM FLOW IN IDEALIZED CHANNEL FLOODPLAIN GEOMETRIES

DATA ISOVELS, FRICTION FACTOR, REYNOLDS NO
KEY WORDS UNIFORM FLOW, IDEALIZED FLOW, FLOOD PLAIN
CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH

FL 90 FT
FW 6 FT
FD 2.4 FT

CL 90 FT
CW 0.93 FT
CD 0.6, 1.4 FT

FCS 6.7 - 37.8(-4)
Q 2.35 - 11.15 CUSECS
INST POINT GAUGES, PITOT TUBE, TRANSDUCERS

AUTHOR DELLEUR J W
PUB'N PASCE, J EM D, VOL 83, EM1, JANUARY, 1957
TITLE THE BOUNDARY LAYER DEVELOPMENT IN OPEN CHANNELS

DATA BOUNDARY LAYER GROWTH, DIMENSIONLESS VEL PARAMETER, DIM DISCHARGE PARAMETER, VEL, DEPTH
KEY WORDS BOUNDARY LAYER, OPEN CHANNELS
CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 15.625 FT
FW 1.141 FT
FD

CL 15.625 FT
CW 1.141 FT
CD

FCS
Q
INST PITOT TUBE, PRESSURE TAPPINGS, MICROMANOMETER, POINT GAUGE

AUTHOR DEMUREN A O, RODI W		PUB`N J FLUID MECHANICS, 1984, VOL 140
TITLE CALCULATION OF TURBULENCE DRIVEN SECONDARY MOTION IN NON CIRCULAR DUCTS		
DATA ISOVELS, REYNOLDS NO, SECONDARY VELOCITIES, SHEAR STRESS, TURBULENCE PROFILE		KEY WORDS TURBULENCE, SECONDARY MOTION, DUCTS
CHANNEL TYPE THRY, EXP, SIMP, SMTH, DUCT		
FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR DRAIN L E		PUB`N JOHN WILEY & SONS, 1980
TITLE THE LASER DOPPLER TECHNIQUE		
DATA		KEY WORDS LASER DOPPLER
CHANNEL TYPE		
FL	FW	FD
CL	CW	CD
FCS	Q	INST LASER DOPPLER ANEMOMETER

AUTHOR DURST, LAUNDER, SCHMIDT, WHITELAW		PUB`N SPRINGER - VERLAG, BERLIN, HEIDELBERG, 1979
TITLE TURBULENT SHEAR FLOWS - 1, SELECTED PAPERS, 1st INTERNATIONAL SYMPOSIUM		
DATA FREE FLOWS, WALL FLOWS, RECIRCULATING FLOWS, REYNOLDS STRESS CLOSURES, MODELLING		KEY WORDS TURBULENCE
CHANNEL TYPE		
FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR DURST, MELLING, WHITELAW
PUB`N ACADEMIC PRESS, 1976
TITLE PRINCIPLES AND PRACTICE OF LASER DOPPLER ANEMOMETRY
DATA
KEY WORDS LASER DOPPLER ANEMOMETER
CHANNEL TYPE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR DYNAMIC FLOW CONFERENCE PROCEEDINGS
PUB`N DYNAMIC FLOW CONFERENCE, DENMARK, APRIL, 1979
TITLE DYNAMIC MEASUREMENTS IN UNSTEADY FLOWS, 1978
DATA MULTIVARIANT FLOW, INTERMITTENT & PERIODIC FLOW, TWO PHASE FLOW, DATA PROCEESING
KEY WORDS DYNAMIC MEASUREMENT, UNSTEADY FLOWS
CHANNEL TYPE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR EINSTEIN H A, BARBAROSSA N L
PUB`N TASCE, VOL 117, 1952
TITLE RIVER CHANNEL ROUGHNESS
DATA FRICTION LOSS, SEDIMENT TRANSPORT, STAGE, DISCHARGE
KEY WORDS ROUGHNESS, RIVER CHANNEL
CHANNEL TYPE PROTO, SIMPLE, COMPOUND
FL
FW
FD
CL 1 - 35.5 MILES
CW 110, 3000 FT
CD 0.45, 13.4 FT
FCS 1.49 - 17.2(-4)
Q 21 - 145,000 CUSECS
INST

AUTHOR EINSTEIN H A, BANKS R B
PUB`N TRANS, AMER. GEOPHYS. UNION, VOL 31, 4, AUG, 1950
TITLE FLUID RESISTANCE OF COMPOSITE ROUGHNESS
DATA RESISTANCE, PEG DENSITY
KEY WORDS FLUID RESISTANCE, COMPOSITE ROUGHNESS
CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH
FL 17 FT
FW 12 IN
FD 18 IN
CL 17 FT
CW 12 IN
CD 18 IN
FCS 7.3 - 10.2(-3)
Q
INST POINT GAUGES

AUTHOR EINSTEIN H A, HARDER J A
PUB`N TRANS, AMER. GEOPHYS. UNION, VOL 35, 1, FEB, 1954
TITLE VELOCITY DISTRIBUTION AND THE BOUNDARY LAYER AT CHANNEL BENDS
DATA RADIAL VELOCITY DISTRIBUTION, FRICTION FACTOR, RELATIVE ROUGHNESS
KEY WORDS VELOCITY, BOUNDARY LAYER, CHANNEL BENDS
CHANNEL TYPE EXP, SIMP, SMTH, RGH, BEND
FL
FW 16 IN
FD 4 IN
CL
CW 16 IN
CD 4 IN
FCS
Q
INST FLOATS

AUTHOR EINSTEIN H A, LI H
PUB`N TRANS AMER GEOPHYS UNION, VOL 39, 6, DEC, 1965
TITLE SECONDARY CURRENTS IN STRAIGHT CHANNELS
DATA VELOCITY, PRESSURE, KINEMATIC VISCOSITY, VORTICITY COMPONENT, REYNOLDS STRESS, SHEAR
KEY WORDS SECONDARY CURRENTS, STRAIGHT CHANNELS
CHANNEL TYPE THEORY, SIMPLE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR ELLIS L B, JOUBERT P N
PUBˋN J FLUID MECH, 1974, VOL 62, PART 1

TITLE TURBULENT SHEAR FLOW IN A CURVED DUCT

DATA VELOCITY DISTRIBUTION, STATIC PRESSURE, FRICTION COEFF, REYNOLDS, SHEAR, ANGULAR VEL
KEY WORDS TURBULENT SHEAR, CURVED DUCT

CHANNEL TYPE EXP, DUCT, SMOOTH

FL	FW 33 IN	FD 2.5 IN
CL	CW 33 IN	CD 2.5 IN
FCS	Q AIR	INST PRESSURE TAPPINGS, TOTAL HEAD PROBE, CLAUSER CHART

AUTHOR ELSAWY E M, McKEE M P, McKEOGH E J
PUBˋN IAHR, MOSCOW, 1983, VOL 3, SEPT, PROC 20 TH CONG

TITLE APPLICATION OF LDA TECH. TO VELOCITY AND TURBULENCE M'MENTS IN OPEN CHANNEL OF COMP SECT

DATA STAGE, DISCHARGE, VELOCITY, CHAINAGE, APPARENT SHEAR STRESS, FLUID SHEAR STRESS
KEY WORDS LASER DOPPLER, TURBULENCE, OPEN CHANNEL, COMPOUND

CHANNEL TYPE EXP, COMPOUND, SMOOTH

FL 9.15 M	FW 0.61 M	FD
CL 9.15 M	CW 0.101, 0.254 M	CD 0.102 M
FCS 2.63(-4)	Q 0.001 - 0.02 CUMECS	INST LASER DOPPLER ANEMOMETER

AUTHOR ELSAWY E M, CRORY P M
PUBˋN INT CONF WATER RESOURCES ENGINEERING, BANGKOK, 1978

TITLE EFFECTS OF INTERACTION ON A CHANNEL WITH ONE FLOODPLAIN

DATA SHEAR DISTRIBUTION, FRICTION FACTOR, MANNINGS N, DEPTH, VELOCITY, RELATIVE DEPTH
KEY WORDS FLOW INTERACTION, COMPOUND CHANNEL, SHEAR STRESS

CHANNEL TYPE EXP, COMP, SMTH, RGH

FL 30 FT	FW 24 IN	FD
CL 30 FT	CW 10 IN	CD 4 IN
FCS 2.645(-4)	Q	INST LASER DOPPLER ANEMOMETER

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.....................................................................................
.AUTHOR ENGELUND F                                              .PUB`N J FLUID MECH,  .
................................................................1975, VOL 72, PART 1 .
.TITLE INSTABILITY OF FLOW IN A CURVED ALLUVIAL CHANNEL         .                     .
.                                                               .                     .
.....................................................................................
.DATA BED ELEVATION, ROTATION SPEED, CONTOURS               .KEY WORDS INSTABILITY,   .
.                                                           .FLOW, CURVED ALLUVIAL    .
............................................................CHANNEL                   .
.CHANNEL TYPE EXP, THRY, SIMPLE, ROUGH                      .                         .
.....................................................................................
.FL 5.65 M                 .FW 0.2 M                  .FD                             .
.....................................................................................
.CL 5.65 M                 .CW 0.2 M                  .CD                             .
.....................................................................................
.FCS                   .Q                     .INST POINT GAUGE                       .
.                      .                      .                                       .
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.....................................................................................
.AUTHOR ENGELUND F                                              .PUB`N PASCE, J HYD   .
................................................................D, VOL 100, HY11,     .
.TITLE FLOW AND BED TOPOGRAPHY IN CHANNEL BENDS                 .NOVEMBER, 1974       .
.                                                               .                     .
.....................................................................................
.DATA BED ELEVATION, SHEAR RATIO, VELOCITY                  .KEY WORDS FLOW, BED      .
.DISTRIBUTION, TRANSVERSE VELOCITY                          .TOPOGRAPHY, CHANNEL      .
............................................................BENDS                     .
.CHANNEL TYPE THEORY, SIMPLE, ROUGH, BEND                   .                         .
.....................................................................................
.FL                        .FW                        .FD                             .
.....................................................................................
.CL                        .CW                        .CD                             .
.....................................................................................
.FCS                   .Q                     .INST                                   .
.                      .                      .                                       .
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.AUTHOR ERVINE D A, BAIRD J I                                   .PUB`N PICE, PART 2,  .
................................................................1982, 73, JUNE, TN    .
.TITLE RATING CURVES FOR RIVERS WITH OVERBANK FLOW              .328                  .
.                                                               .                     .
.....................................................................................
.DATA APPARENT SHEAR STRESS, VELOCITY DIFFERENTIAL          .KEY WORDS RATING CURVE,  .
.                                                           .OVERBANK FLOW            .
............................................................                          .
.CHANNEL TYPE THEORY, SIMP , COMP                           .                         .
.....................................................................................
.FL                        .FW                        .FD                             .
.....................................................................................
.CL                        .CW                        .CD                             .
.....................................................................................
.FCS                   .Q                     .INST                                   .
.                      .                      .                                       .
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AUTHOR EUROMECH 130

PUB`N EUROMECH 130, BELGRADE , YUGOSLAVIA, 1980

TITLE TURBULENT DIFFUSION AND DISPERSION IN OPEN CHANNEL FLOW

DATA

KEY WORDS TURBULENCE, DIFFUSION, DISPERSION

CHANNEL TYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR FARBER K

PUB`N HOCHSCHULE DER BUNDESWEHR, MUNCHEN, 14, 1985

TITLE TURBULENCE PARAMETER M`MENT IN OPEN CHANNELS USING LASER DOPPLER ANEM AND PITOT TUBE

DATA AUTOCOVARIANCE, VELOCITY, TIME SCALE, TURBULENCE, PRESSURE

KEY WORDS TURBULENCE, LASER DOPPLER ANEMOMETER, PITOT TUBE

CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 4.75 M

FW 0.4 M

FD 0.42 M

CL 4.75 M

CW 0.4 M

CD 0.42 M

FCS

Q

INST LASER DOPPLER ANEMOMETER, PITOT TUBE

AUTHOR FIRTH R J

PUB`N UKAEA REPORT, SESSION 2, PAPER 2, ND-R-340(W), MAY, 1979

TITLE AN INTERPRETATION OF ROUGH SURFACE HEAT TRANSFER USING ROUGHNESS PARAMETERS

DATA DRAG COEFF, RIB PITCH,HEIGHT, WIDTH; WALL & BULK TEMPERATURE, ROUGHNESS PARAMETER

KEY WORDS ROUGH SURFACE, HEAT TRANSFER

CHANNEL TYPE THRY, EXP, RGH, DUCT

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR FIRTH R J, MEYER L
PUBˋN INT J HEAT MASS TRANSFER, VOL 26, NO 2, 1983
TITLE COMP. OF HEAT TRANSFER & FRICT FACTOR PERFORMANCE OF 4 DIFF TYPES OF ARTIFIC. ROUGH. SURFACE
DATA ROUGHNESS RATIO, FRICTION FACTOR, REYNOLDS NO, STANTON NO, RELATIVE THERMAL PERFORMANCE
KEY WORDS HEAT TRANSFER, ROUGH SURFACES, ARTIFICIAL
CHANNEL TYPE EXP, RGH, DUCT
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR FLOKSTRA C
PUBˋN DELFT HYDRAULICS LABORATORY, S 163, 2, JULY, 1976
TITLE GENERATION OF TWO DIMENSIONAL HORIZONTAL SECONDARY CURRENTS
DATA
KEY WORDS CALCULATION, SECONDARY FLOW
CHANNEL TYPE THRY, EXP, SMTH, RGH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR FLOOD R D
PUBˋN SEDIMENTOLOGY, 1981, 28
TITLE DISTRIBUTION, MORPHOLOGY, & ORIGIN OF SEDIMENTARY FURROWS IN COHESIVE SED., SOUTHAMPTON WATER
DATA VELOCITY, SALINITY, FURROW SPACING, TEMPERATURE, RICHARDSON NO, SECONDARY FLOW, ECHO SOUNDING
KEY WORDS SEDIMENTARY FURROWS, SECONDARY FLOW
CHANNEL TYPE PROTO, EXP, SIMP, RGH
FL
FW
FD
CL
CW
CD
FCS
Q
INST SONAR, ECHO SOUNDING, CURRENT METERS, SALINITY METER, THERMOMETER

AUTHOR FRANCIS J R D, ASFARI A F

PUB'N J HYD RESEARCH, 9, 1, 1971

TITLE VELOCITY DISTRIBUTIONS IN WIDE,CURVED OPEN CHANNEL FLOWS

DATA RADIAL & TANGENTIAL VELOCITY, ASPECT RATIO, DEPTH, ISOVELS

KEY WORDS VELOCITY DISTRIBUTION, WIDE CURVED OPEN CHANNEL

CHANNEL TYPE THRY, EXP, SIMP, SMTH, BEND

FL 13.57 M	FW 0.61 M	FD
CL 13.57 M	CW 0.255, 0.61 M	CD
FCS	Q 0.00275 - 0.0044 CUMECS	INST MINIATURE CURRENT METER, POINT GAUGE

AUTHOR FRANZ D D

PUB'N PASCE, J HYD D, VOL 108, HY6, JUNE, 1982

TITLE MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN CHANNEL (DISCUSSION)

DATA

KEY WORDS SPECIFIC ENERGY, OPEN CHANNEL, COMPOUND

CHANNEL TYPE THRY, EXP, COMP, SMTH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR FUKUOKA S, KIM S, EGUCHI S

PUB'N 5 TH CONG. IAHR, ASIAN & PACIFIC REG DIV, AUG, 1986

TITLE STRUCTURES OF THE MEAN FLOW IN MEANDERING CHANNELS WITH ASYMMETRIC CONTINUOUS BENDS

DATA DEPTH AVERAGED VELOCITY, SECONDARY FLOW, VEL DISTRIBUTION, MOTION & CONTINUITY EQUATIONS

KEY WORDS MEANDERS, SECONDARY FLOW,

CHANNEL TYPE EXP, THRY, SIMP, SMTH, BEND

FL 23 M	FW 0.3 M	FD
CL 3 M	CW 0.3 M	CD
FCS 1.25(-3)	Q 0.00657 CUMECS	INST PITOT TUBE

.AUTHOR FUTIAN L
.PUB`N J SEDIMENT RESEARCH, 1 , 1986, BEIJING
.TITLE THE TURBULENT STRUCTURE OF CHANNEL FLOW WITH SUSPENDED SEDIMENT
.DATA VEL. DISTRIBUTION, VON KARMAN , PARTICLE DIAM., VEL FLUCTUATION,
.KEY WORDS TURBULENCE, SEDIMENT TRANSPORT
.CHANNEL TYPE EXP, THRY, SIMP, SMTH, RGH

.FL 5 M	.FW 10 CM	.FD 15 CM
.CL 5 M	.CW 10 CM	.CD 15 CM
.FCS	.Q 1100 - 1160 CM 3/S	.INST LASER DOPPLER VELOCIMETER

.AUTHOR GADDINI B, MORGANTI M
.PUB`N LA HOUILLE BLANCHE, 4, 1982
.TITLE TURBULENT SHEAR STRESSES AND VELOCITY DISTRIBUTION IN OPEN CHANNEL FLOWS
.DATA ISOVELS, TURBULENCE INTENSITY, SHEAR
.KEY WORDS PRIMARY FLOW, SECONDARY FLOW, TURBULENT SHEAR STRESS
.CHANNEL TYPE EXPERIMENTAL, SIMPLE

.FL 5 M	.FW 0.31 M	.FD 0.29 M
.CL 5 M	.CW 0.31 M	.CD 0.29 M
.FCS 1.06(-3)	.Q	.INST HOT FILM ANEMOMETER

.AUTHOR GERARD R
.PUB`N PASCE, J HYD D, VOL 104, HY5, MAY, 1978
.TITLE SECONDARY FLOW IN NONCIRCULAR CONDUITS
.DATA FORCING FUNCTION, SECONDARY FLOW STREAM FUNCTION, BACKGROUND TURBULENCE
.KEY WORDS SECONDARY FLOW, NONCIRCULAR CONDUITS
.CHANNEL TYPE THEORY, SIMPLE, SMOOTH

.FL	.FW	.FD
.CL	.CW	.CD
.FCS	.Q	.INST

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.................................................................................
.AUTHOR GERARD R                                         .PUB`N PASCE, J HYD    .
..........................................................D, VOL 103, HY10,     .
.TITLE MOMENTUM TRANSFER MODEL FOR REYNOLDS STRESSES     .OCTOBER, 1977         .
.                                                        .                      .
.................................................................................
.DATA TURBULENT VELOCITY FLUCTUATIONS, CORRELATION   .KEY WORDS MOMENTUM        .
.COEFFICIENT                                         .TRANSFER, REYNOLDS        .
......................................................STRESS                    .
.CHANNEL TYPE THEORY, SIMPLE, SMOOTH                 .                          .
.................................................................................
.FL                      .FW                         .FD                        .
.................................................................................
.CL                      .CW                         .CD                        .
.................................................................................
.FCS                 .Q                    .INST                                .
.                    .                     .                                    .
.................................................................................


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.AUTHOR GERARD R, BAINES W D                             .PUB`N PASCE, J HYD    .
..........................................................D, VOL 103, HY8,      .
.TITLE TURBULENT FLOW IN VERY NON CIRCULAR CONDUIT       .AUGUST, 1977          .
.                                                        .                      .
.................................................................................
.DATA BOUNDARY SHEAR, VELOCITY DISTRIBUTION,         .KEY WORDS TURBULENT       .
.ISOVELS, REYNOLDS NO, FORM FACTOR                   .FLOW, CONDUIT             .
......................................................                          .
.CHANNEL TYPE EXP, SMOOTH, PIPE                      .                          .
.................................................................................
.FL 3, 12.71 M           .FW 0.0036, 0.0178 M HYD. .FD                          .
.................................................................................
.CL 3, 6.1 M             .CW 0.0036, 0.0178 M      .CD                          .
.................................................................................
.FCS                 .Q AIR                .INST PEIZOMETRIC TAPPINGS, PRESTON .
.                    .                     .TUBE, PITOT TUBE                    .
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.AUTHOR GESSNER F B                                      .PUB`N J FLUID MECH,   .
..........................................................1973, VOL 58, 1       .
.TITLE THE ORIGIN OF SECONDARY FLOW IN TURBULENT FLOW    .                      .
.ALONG A CORNER                                          .                      .
.................................................................................
.DATA ISOVEL, TURBULENT SHEAR STRESS, VORTICITY,     .KEY WORDS SECONDARY       .
.ENERGY BALANCE                                      .FLOW, TURBULENT FLOW,     .
......................................................CORNER                    .
.CHANNEL TYPE THRY, EXP, DUCT, SMOOTH                .                          .
.................................................................................
.FL 79 FT                .FW 10 IN                   .FD 10 IN                  .
.................................................................................
.CL 79 FT                .CW 10 IN                   .CD 10 IN                  .
.................................................................................
.FCS                 .Q AIR                .INST HOT WIRE ANEMOMETER, PRESSURE .
.                    .                     .TAPPINGS                            .
.................................................................................
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AUTHOR GESSNER F B, JONES J B
PUB'N J FLUID MECH, 1965, VOL 23, 4
TITLE ON SOME ASPECTS OF FULLY DEVELOPED TURBULENT FLOW IN RECTANGULAR CHANNELS
DATA ISOVELS, SECONDARY FLOW PROFILES, WALL SHEAR AND VISCOUS STRESS, TURBULENCE, CONVECTION
KEY WORDS TURBULENT FLOW, RECTANGULAR CHANNELS
CHANNEL TYPE EXP, DUCT, SMOOTH, ROUGH

FL 30 FT	FW 8 IN	FD 8IN
CL 30 FT	CW 8 IN	CD 4, 8 IN
FCS	Q AIR	INST PRESSURE TAPPINGS, HOT WIRE ANEMOMETER, PITOT TUBE

AUTHOR GESSNER F B, EMERY A F
PUB'N J FLUIDS ENGINEERING, TASME, VOL 103, SEPT, 1981
TITLE THE NUMERICAL PREDICTION OF DEVELOPING TURBULENT FLOW IN RECTANGULAR DUCTS
DATA SHEAR STRESS, FRICTION FACTOR, VEL. DIST., SECONDARY FLOW, TURBULENCE KINETIC ENERGY
KEY WORDS TURBULENCE, DUCTS, SHEAR STRESS
CHANNEL TYPE EXP, THRY, SIMP, SMTH, DUCT

FL 22 M	FW 0.254 M	FD 0.254 M
CL 22 M	CW 0.254 M	CD 0.254 M
FCS	Q AIR	INST PIEZOMETERS, PRESTON TUBE, HOT WIRE ANEMOMETER, KIEL TUBE

AUTHOR GESSNER F B, EMERY A F
PUB'N TASME, J FLUIDS ENG., JUNE, 1976
TITLE A REYNOLDS STRESS MODEL FOR TURBULENT CORNER FLOWS - PART 1: DEVELOPMENT OF THE MODEL
DATA CO-ORDINATE SYSTEM, VELOCITY COMPONENTS, NORMALIZED REYNOLDS STRESS
KEY WORDS TURBULENT CORNER FLOW, REYNOLDS STRESS
CHANNEL TYPE THRY, EXP, SIMP, COMP, DUCT

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR GESSNER F B, PO J K
PUB`N TASME, J FLUIDS ENG., JUNE, 1976

TITLE A REYNOLDS STRESS MODEL FOR TURBULENT CORNER FLOWS - PART 2: COMPARISONS BETWEEN THEORY & EXP.

DATA CO-ORDINATE SYSTEM, MIXING LENGTH, NORMAL STRESS, REYNOLDS STRESS, TURBULENT KINETIC ENERGY
KEY WORDS TURBULENT CORNER FLOWS, REYNOLDS STRESS

CHANNEL TYPE EXP, SIMP, SMTH, DUCT

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR GHOSH S N
PUB`N PICE, VOL-53, 7572, DECEMBER, 1972

TITLE BOUNDARY SHEAR DISTRIBUTION IN CHANNELS WITH VARYING WALL ROUGHNESS

DATA ISOVELS, BOUNDARY SHEAR, BED FRICTION
KEY WORDS BOUNDARY SHEAR DISTRIBUTION, VARYING WALL ROUGHNESS

CHANNEL TYPE EXP, ROUGHENED, SIMPLE

FL 51 FT	FW 3 FT	FD
CL 44 FT	CW 0.656 FT	CD
FCS 3.02(-3)	Q 0.48 - 0.93 CUSECS	INST PRESTON TUBE, PITOT STATIC TUBE, DRAG BALANCE , V-NOTCH, MANOMETE

AUTHOR GHOSH S, JENA S B
PUB`N PICE, VOL-49, 7404, AUGUST, 1971

TITLE BOUNDARY SHEAR DISTRIBUTION IN OPEN CHANNEL COMPOUND

DATA BOUNDARY SHEAR, TRACTIVE FORCE
KEY WORDS BOUNDARY SHEAR, COMPOUND CHANNEL

CHANNEL TYPE EXP, COMPOUND, ROUGHENED

FL 30 FT	FW 2 FT	FD 2 FT
CL 28 FT	CW 8 IN	CD 4 IN
FCS 5.25(-3)	Q 0.919 - 2.0 CUSECS	INST PRESTON TUBE, PITOT STATIC TUBE, VOLUMETRIC

AUTHOR GHOSH S N, MEHTA P A
PUB`N PICE, VOL-57, TN-91, MARCH, 1974
TITLE BOUNDARY SHEAR DISTRIBUTION IN A CHANNEL WITH VARYING ROUGHNESS DISTRIBUTION
DATA BED SHEAR, FLOOD PLAIN SHEAR, BOUNDARY SHEAR, ISOVELS
KEY WORDS BOUNDARY SHEAR, ROUGHENED COMPOUND CHANNEL
CHANNEL TYPE EXP, COMPOUND, ROUGHENED
FL   FW   FD
CL   CW 8 IN   CD 4 IN
FCS 5.25(-3)   Q 0.919 - 2.0 CUSECS   INST PRESTON TUBE

AUTHOR GHOSH S N, ROY N
PUB`N PASCE, J HYD D, VOL-96, HY4, 7241, APRIL, 1970
TITLE BOUNDARY SHEAR DISTRIBUTION IN OPEN CHANNEL FLOW
DATA SHEAR STRESS
KEY WORDS SHEAR DISTRIBUTION, OPEN CHANNELS
CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH
FL 51 FT   FW 3 FT   FD
CL 44 FT   CW 0.656 FT   CD
FCS 3.02(-3)   Q 0.176 - 1.165 CUSECS   INST PRESTON TUBE, DRAG BALANCE, V-NOTCH, MANOMETER

AUTHOR GHOSH S N, KAR S K
PUB`N PICE, 1975, PART 2, 59, DECEMBER
TITLE RIVER FLOODPLAIN INTERACTION & DISTRIBUTION OF BOUNDARY SHEAR STRESS IN MEANDER CHANNEL
DATA VELOCITY, DEPTH, DISCHARGE RATIOS, RELATIVE DEPTHS, BOUNDARY SHEAR
KEY WORDS INTERACTION, RIVER FLOW, FLOODPLAIN FLOW, MEANDER
CHANNEL TYPE EXP, COMP, SMTH, RGH,
FL 10 M   FW 0.60 M   FD
CL 10 M   CW 0.1 M   CD 0.10 M
FCS 6.1(-4)   Q   INST PITOT TUBE, MANOMETER

AUTHOR GHOSH S N, MISRA L K

PUB`N PICE, PART 2, 1977, 63, SEPT, TN 166

TITLE FREQ DISTRIB OF BOUND SHEAR & EFFECT OF NON UNIF ON SHEAR DISTRIB IN OPEN CHAN FLOW RESIST.

DATA FREQUENCY DISTRIBUTION, BOUNDARY SHEAR, ASPECT RATIO, SHAPE COEFF, FRICTION, VELOCITY

KEY WORDS FREQUENCY, BOUNDARY SHEAR, RESISTANCE, OPEN CHANNEL

CHANNEL TYPE EXP, SIMP, COMP, SMTH, RGH

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR GHOSH S N

PUB`N PICE, PAPER 7592, VOL 55, JUNE, 1973

TITLE BOUNDARY SHEAR DISTRIBUTION IN A ROUGH COMPOUND CHANNEL (SYNOPSIS)

DATA

KEY WORDS BOUNDARY SHEAR, ROUGH COMPOUND CHANNEL

CHANNEL TYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR GHOSH S N

PUB`N PICE, PAPER 7572, VOL 55, JUNE, 1973

TITLE BOUNDARY SHEAR DISTRIBUTION IN CHANNELS WITH VARYING WALL ROUGHHNESS (DISCUSSION)

DATA ISOVELS, BOUNDARY SHEAR

KEY WORDS BOUNDARY SHEAR, OPEN CHANNEL, VARIABLE WALL ROUGHNESS

CHANNEL TYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR GONCHAROV V N

TITLE DYNAMICS OF CHANNEL FLOW

PUB`N ISRAEL PROGRAM SCIENTIFIC TRANS, JERUSALEM, 1964

DATA RIGID CHANNEL FLOW DYNAMICS, DEFORMABLE CHANNEL FLOW DYNAMICS

KEY WORDS FLOW DYNAMICS, OPEN CHANNEL

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR GORDIENKO P I

TITLE INFLUENCE OF CHANNEL ROUGHNESS & FLOW STATES ON HYD RESISTANCES OF TURBULENT FLOW

PUB`N J HYDRAULIC RESEARCH, 5, 1967, 4

DATA CHEZY COEFFICIENT, RELATIVE DEPTH

KEY WORDS ROUGHNESS, TURBULENT FLOW

CHANNEL TYPE EXP, SIMP, ROUGH

FL	FW 0.4, 1.50 M	FD
CL 8 M	CW 0.4, 1.50 M	CD
FCS 2.07 - 164 -3	Q	INST

AUTHOR GOSMAN A D, RAPLEY C W

TITLE FULLY DEVELOPED FLOW IN PASSAGES OF ARBITRARY CROSS SECTION

PUB`N RECENT ADVANCES IN NUMERICAL METHODS OF FLUIDS, 1980

DATA SHEAR & REYNOLDS STRESS, VEL PROFILES, TURBULENCE ENERGY, SECONDARY FLOW, FRICTION FACTOR

KEY WORDS SHEAR, TURBULENCE, SECONDARY FLOW, DUCTS

CHANNEL TYPE EXP, THRY, SMTH, SIMP, DUCT

FL	FW	FD
CL	CW	CD
FCS	Q	INST

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................................................................................
.AUTHOR GOTTLIEB L                                       .PUB`N TECHNICAL      .
.........................................................UNIVERSITY OF        .
.TITLE THREE DIMENSIONAL FLOW PATTERN AND BED TOPOGRAPHY .DENMARK, 11,         .
.IN MEANDERING CHANNELS                                  .FEBRUARY, 1976       .
................................................................................
.DATA VELOCITY PROFILE, TRANSVERSE FLOW FIELD, BED   .KEY WORDS THREE          .
.PROFILE, VELOCITY VECTOR DEVIATION                  .DIMENSIONAL FLOW         .
.....................................................PATTERN, MEANDERING       .
.CHANNEL TYPE THRY, EXP, ROUGH, SIMPLE               .CHANNEL                  .
................................................................................
.FL 18 M                 .FW 2 M                   .FD                         .
................................................................................
.CL 12 M                 .CW 1 M                   .CD                         .
................................................................................
.FCS                 .Q 65 - 75 L/S        .INST MIN CURRENT METER, VELOCITY   .
.                    .                     .VECTOR PROBE                       .
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.AUTHOR GOTZ W                                           .PUB`N PASCE, J HYD   .
.........................................................D, VOL 106, HY10,     .
.TITLE SECONDARY FLOW AND SHEAR STRESS AT RIVER BENDS    .OCTOBER, 1980        .
.(DISCUSSION)                                            .                     .
................................................................................
.DATA SECONDARY CURRENT INTENSITY, SECONDARY         .KEY WORDS SECONDARY FLOW .
.VELOCITY                                            .                         .
......................................................                         .
.CHANNEL TYPE EXP, PROTO, SIMP, BEND                 .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR GRASS A J                                        .PUB`N J FLUID MECH., .
.........................................................1971, VOL 50, PART 2 .
.TITLE STRUCTURAL FEATURES OF TURBULENT FLOW OVER SMOOTH .                     .
.AND ROUGH BOUNDARIES                                    .                     .
................................................................................
.DATA TURBULENCE INTENSITY, REYNOLDS STRESS,         .KEY WORDS TURBULENT      .
.VELOCITY                                            .FLOW, STRUCTURE          .
......................................................                         .
.CHANNEL TYPE EXP, SIMP, SMTH, RGH                   .                         .
................................................................................
.FL 10 M                 .FW 0.25 M                .FD                         .
................................................................................
.CL 10 M                 .CW 0.25 M                .CD                         .
................................................................................
.FCS                 .Q                    .INST MINIATURE CURRENT METER,      .
.                    .                     .POINT GAUGE                        .
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AUTHOR GRIJSEN J G, MEIJER Th J G P

PUB'N DELFT HYDRAULICS LAB, 227, MARCH 1980

TITLE ON THE MODELLING OF FLOOD FLOW IN LARGE RIVER SYSTEMS WITH FLOOD PLAINS

DATA CHANNEL CELL, COORDINATES, JUNCTIONS, CROSS SECTIONS, WATER LEVELS, DISCHARGE, STRUCTURES

KEY WORDS ONE DIMENSIONAL MATHEMATICAL MODEL

CHANNEL TYPE THEORY, ROUGH, PROTO, COMP

FL	FW	FD
CL 1700 KM	CW	CD
FCS	Q 5,000 - 40,000 CUMECS	INST

AUTHOR HAALAND S E

PUB'N TASME, J FLUIDS ENG., VOL 105, MARCH, 1983

TITLE SIMPLE & EXPLICIT FORMULAS FOR THE FRICTION FACTOR IN TURBULENT PIPE FLOW

DATA FRICTION FACTOR, REYNOLDS NO, RELATIVE ROUGHNESS

KEY WORDS TURBULENT PIPE FLOW, FRICTION FACTOR, FORMULAE

CHANNEL TYPE THRY, SMTH, RGH, PIPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR HADRYS H P

PUB'N PASCE, J HYD D, VOL 111, HY5, MAY, 1985

TITLE FLOOD PLAIN AND MAIN CHANNEL FLOW INTERACTION (DISCUSSION)

DATA APPARENT SHEAR FORCE RATIO, RELATIVE DEPTH

KEY WORDS FLOODPLAIN, MAIN CHANNEL, FLOW INTERACTION

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR HARTNETT J P, KOH J C Y, McCOMAS S T

PUB`N TASME, J HEAT TRANSFER, FEB, 1962

TITLE COMPARISON OF PRED. AND MEAS. FRICTION FACTORS FOR TURB. FLOW THROUGH RECT. DUCTS

DATA VEL PROFILE, TURBULENT VEL DISTRIBUTION, FRICTION FACTOR, REYNOLDS NO, PRESSURE GRADIENT

KEY WORDS FRICTION FACTOR, TURBULENT FLOW, DUCT

CHANNEL TYPE EXP, SIMP, SMTH, DUCT

FL 12 FT	FW 0.5645, 3.112 IN	FD 0.31, 0.56 IN
CL 12 FT	CW 0.56, 3.11 IN	CD 0.31, 0.56 IN
FCS	Q AIR	INST PIEZOMETRIC TAPPINGS

AUTHOR HEAD M R

PUB`N AERONAUTICAL QUARTERLY , NOVEMBER, 1976

TITLE EDDY VISCOSITY IN TURBULENT BOUNDARY LAYERS

DATA EDDY VISCOSITY, RELAXING FLOW , DIVERGING FLOW, SEPARATING FLOW

KEY WORDS TURBULENT BOUNDARY LAYER , EDDY VISCOSITY

CHANNEL TYPE THRY, EXP

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR HEGGE ZIJNEN B G van der

PUB`N DELFT REPORT 364 S, APRIL, 1948

TITLE TURBULENCE:ALLY AND ENEMY

DATA

KEY WORDS TURBULENCE

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

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.................................................................................
.AUTHOR HEGLY M                                          .PUB`N ANNALES DES      .
.........................................................PONTS ET CHAUSSEES,    .
.TITLE THE FLOW OF WATER IN A CHANNEL OF COMPLEX CROSS   .NO 23, 1936            .
.SECTION  ( IN FRENCH )                                  .                       .
.................................................................................
.DATA ISOVELS, CROSS SECTIONS, FLOAT TRACKS, CHEZY   .KEY WORDS COMPOUND         .
.COEFFICIENT, FLOAT TRACKS                           .CHANNEL, SECONDARY FLOW    .
......................................................                           .
.CHANNEL TYPE PROTO, COMP, SMTH, EXP, THY            .                           .
.................................................................................
.FL 61, 215 M            .FW 3.04, 7.6 M           .FD 0.32, 0.8 M               .
.................................................................................
.CL 41, 215 M            .CW 0.66, 1.65 M          .CD 0.12, 0.5 M               .
.................................................................................
.FCS 2.2 - 112(-5)   .Q 0.15 - 1.5  CUMECS .INST PITOT TUBE                      .
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.AUTHOR HERBICH J B, SHULITS S                           .PUB`N PASCE, VOL 90,  .
.........................................................HY6, NOVEMBER, 1964    .
.TITLE LARGE SCALE ROUGHNESS IN OPEN CHANNEL FLOW        .                       .
.                                                        .                       .
.................................................................................
.DATA DEPTH, ROUGHNESS PARAMETER, RESISTANCE COEFF,  .KEY WORDS OPEN CHANNEL    .
.REYNOLDS NO, UNIT DISCHARGE                         .FLOW, LARGE SCALE          .
.....................................................ROUGHNESS                  .
.CHANNEL TYPE EXP, SIMP, ROUGH                       .                           .
.................................................................................
.FL 53 FT                .FW 5.5 FT                .FD 1 FT                      .
.................................................................................
.CL 53 FT                .CW 5.5 FT                .CD 1 FT                      .
.................................................................................
.FCS 3 - 30(-3)      .Q 0.182 - 0.909      .INST POINT GAUGE                     .
.                    .CUSECS               .                                     .
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.AUTHOR HEY R D                                          .PUB`N IWES, VOL 40,    .
.........................................................2, APRIL, 1986         .
.TITLE RIVER MECHANICS                                   .                       .
.                                                        .                       .
.................................................................................
.DATA SECONDARY FLOW, BOUNDARY STRESS, SEDIMENT      .KEY WORDS SECONDARY        .
.TRANSPORT, REGIME FORMULAE                          .FLOW, BOUNDARY SHEAR       .
......................................................                           .
.CHANNEL TYPE PROTO, EXP, SIMP, RGH                  .                           .
.................................................................................
.FL                      .FW                       .FD                           .
.................................................................................
.CL                      .CW                       .CD                           .
.................................................................................
.FCS                 .Q                    .INST                                 .
.                    .                     .                                     .
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.AUTHOR HINZE J O                                         .PUB`N McGRAW HILL     .
...........................................................BOOK COMPANY, 1959    .
.TITLE TURBULENCE - AN INTRODUCTION TO ITS MECHANISM AND .                       .
.THEORY                                                   .                       .
..................................................................................
.DATA TURBULENT FLOWS, ISOTROPIC TURBULENCE,          .KEY WORDS TURBULENCE     .
.NONISOTROPIC TURBULENCE                              .                          .
.......................................................                          .
.CHANNEL TYPE                                         .                          .
..................................................................................
.FL                        .FW                        .FD                        .
..................................................................................
.CL                        .CW                        .CD                        .
..................................................................................
.FCS                   .Q                     .INST                              .
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.AUTHOR HOLLEY I R, ABRAHAM G                             .PUB`N DELFT           .
...........................................................PUBLICATION NO 127,   .
.TITLE LABORATORY STUDIES ON TRANSVERSE MIXING IN RIVERS  .JUNE 1974             .
.                                                         .                       .
..................................................................................
.DATA VELOCITY DISTRIBUTION, VARIANCE CONCENTRATION   .KEY WORDS TRANSVERSE     .
.DISTRIBUTION, TRANSVERSE CONC. DIST.                 .MIXING, RIVERS           .
.......................................................                          .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                      .                          .
..................................................................................
.FL 16.5 M                 .FW 2.2 M                  .FD                        .
..................................................................................
.CL 16.5 M                 .CW 1.22, 2.2 M            .CD                        .
..................................................................................
.FCS                   .Q 14 L/S              .INST FLUOROMETER                  .
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..................................................................................
.AUTHOR HOLLEY E R, KARELSE M                             .PUB`N DELFT           .
...........................................................PUBLICATION NO 116,   .
.TITLE MODEL PROTOTYPE COMPARISONS FOR TRANSVERSE MIXING  .MARCH 1974            .
.IN RIVERS                                                .                       .
..................................................................................
.DATA CONCENTRATION DISTRIBUTION, DISTANCE            .KEY WORDS MODEL,         .
.                                                     .PROTOTYPE, TRANSVERSE    .
.......................................................MIXING                    .
.CHANNEL TYPE SIMPLE, EXP, PROTO, ROUGH               .                          .
..................................................................................
.FL 22, 35.9 M             .FW 1.22, 2.62 M           .FD                        .
..................................................................................
.CL 22 M (1.1 KM); 35.9 M.CW 1.22, 2.62 M             .CD                        .
..................................................................................
.FCS                   .Q 0.0141; 0.04        .INST FLUOROMETER                  .
.                      .CUMECS                .                                  .
..................................................................................
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AUTHOR HOLLEY E R, ABRAHAM G

PUB`N PASCE, J HYD D, VOL 99, HY12, DECEMBER, 1973

TITLE FIELD TESTS ON TRANSVERSE MIXING IN RIVERS

DATA DEPTH, DISTANCE, TRACER FLUX, CONCENTRATIONS, CONC DISTRIBUTION VARIANCE

KEY WORDS FIELD TESTS, TRANSVERSE MIXING, RIVERS

CHANNEL TYPE SIMPLE, ROUGH, PROTO

FL	FW	FD
CL 8.6, 10 KM	CW 80, 260 M	CD 4, 4.7 M
FCS	Q 270 - 1000 CUMECS	INST FLUOROMETER

AUTHOR HOLLICK M

PUB`N PASCE, J HYD D, VOL 102, HY7, JULY, 1976, TECH NOTE

TITLE BOUNDARY SHEAR STRESS MEASUREMENT BY PRESTON TUBE

DATA

KEY WORDS PRESTON TUBE

CHANNEL TYPE EXP, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST PRESTON TUBE

AUTHOR HOOKE R L

PUB`N UPPSALA UNIVERSITY, REPORT NO 30, 1974

TITLE SHEAR STRESS AND SEDIMENT DISTRIBUTION IN A MEANDER BEND

DATA SEDIMENT DISCHARGE, REL. SHEAR STRESS, DISTANCE; BED, HELIX, SHEAR & TRANSPORT CONTOURS

KEY WORDS SHEAR STRESS, SEDIMENT DISTRIBUTION, MEANDER BEND

CHANNEL TYPE EXP, SIMPLE, ROUGH, SMOOTH

FL 20 M	FW 1 M	FD
CL 13.2 M	CW 1 M	CD 0.132 M
FCS 1.01 - 2.21(-3)	Q 10 - 50.5 L/S	INST POINT GAUGES, STATIC TUBE, PRESSURE TRANSDUCER, PRESTON TUBE

AUTHOR HUFFMAN G D, BRADSHAW P

PUB`N J FLUID MECHANICS, 1972, VOL 53, 1

TITLE A NOTE ON VON KARMAN`S CONSTANT IN LOW REYNOLDS NUMBER TURBULENT FLOWS

DATA REYNOLDS NO, REYNOLDS STRESS, VISCOUS LENGTH SCALE, BOUNDARY LAYER

KEY WORDS VON KARMAN CONSTANT, LOW REYNOLDS NO, TURBULENCE

CHANNEL TYPE THRY, EXP, SIMP, PIPE, DUCT

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR HULSING H, SMITH W, COBB E D

PUB`N US GEOL SURVEY WATER SUPPLY PAPER 1869 C, 1966

TITLE VELOCITY HEAD COEFFICIENTS IN OPEN CHANNELS

DATA VELOCITY HEAD COEFFICIENT, MANNINGS N

KEY WORDS COMPOUND CHANNEL, VELOCITY HEAD COEFFICIENT

CHANNEL TYPE PROTO, EXP, THRY, COMP, RGH

FL

FW

FD

CL

CW 3.5, 4030 FT

CD

FCS

Q 1.1 - 636,000 CUSECS

INST CURRENT METER

AUTHOR HUMPHREY J A C, WHITELAW J H, YEE G

PUB`N J FLUID MECHANICS, 1981, VOL 3

TITLE TURBULENT FLOW IN A SQUARE DUCT WITH STRONG CURVATURE

DATA ISOVELS, TURBULENCE INTENSITY, REYNOLDS STRESSES

KEY WORDS TURBULENCE, REYNOLDS STRESSES, DUCT, BEND

CHANNEL TYPE EXP, SIMP, SMTH, DUCT

FL 3.145 M

FW 0.04 M

FD 0.04 M

CL 3.145 M

CW 0.04 M

CD 0.04 M

FCS

Q AIR

INST LASER DOPPLER ANEMOMETER

AUTHOR HUSSEIN A S A, SMITH K V H
TITLE FLOW AND BED DEVIATION IN CURVED OPEN CHANNELS
PUB`N J HYDRAULIC RESEARCH, VOL 24, 2, 1986
DATA VELOCITY DISTRIBUTION, EDDY VISCOSITY, RADIAL VELOCITY, ROUGHNESS, WIDTH DEPTH RATIO
KEY WORDS SHEAR STRESS, EDDY VISCOSITY, OPEN CHANNEL
CHANNEL TYPE THRY, SIMP, SMTH, RGH, BEND
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR HWANG L S, LAURSEN E M
TITLE SHEAR MEASUREMENT TECHNIQUE FOR ROUGH SURFACES
PUB`N PASCE, J HYD D, VOL 89, HY2, MARCH, 1963
DATA PRESSURE SHEAR RATIO, LAMINAR, TRANSITIONAL, TURBULENT FLOW
KEY WORDS SHEAR MEASUREMENT, PRESTON TUBE
CHANNEL TYPE EXP, PIPE, ROUGH
FL 40 FT
FW 5.75 IN DIAM.
FD
CL 40 FT
CW 5.75 IN DIAM.
CD
FCS
Q
INST PRESTON TUBE

AUTHOR IKEDA S
TITLE ON SECONDARY FLOW AND BED PROFILE IN ALLUVIAL CURVED OPEN CHANNEL
PUB`N IAHR, 1975, SAO PAULO, VOL 2, PAPER B14
DATA SECONDARY FLOW PROFILE, BED PROFILE, FLOW DEPTH, EDDY VISCOSITY
KEY WORDS SECONDARY FLOW, BED PROFILE, OPEN CHANNEL, BEND
CHANNEL TYPE THRY, EXP, SIMP, RGH, BEND
FL 2.4 M
FW 1.0 M
FD
CL 2.4 M
CW 1.0 M
CD
FCS
Q 25 L/S
INST PITOT TUBE

.AUTHOR IKEDA S, TANAKA M, CHIYODA M

.PUB‘N SAITAMA UNIV., DEPT. FOUND. & CONST. ENG., 14, 1984

.TITLE TURBULENT FLOW IN A SINUOS AIR DUCT

.DATA ABSTRACT

.KEY WORDS REYNOLDS STRESS, TURBULENCE KINETIC ENERGY

.CHANNEL TYPE EXP, SMOOTH, DUCT, BEND

.FL .FW .FD

.CL .CW .CD

.FCS .Q AIR .INST HOT WIRE ANEMOMETER, PITOT TUBE

.AUTHOR IKEDA S

.PUB‘N PASCE, J HYD D, VOL 107, HY4, APRIL, 1981

.TITLE SELF FORMED STRAIGHT CHANNELS IN SANDY BEDS

.DATA WIDTH, DEPTH ,SLOPE, SHEAR STRESS, ISOVELS, SEDIMENT TRANSPORT, BANK PROFILE

.KEY WORDS SECONDARY CURRENTS, STRAIGHT CHANNELS

.CHANNEL TYPE EXP, SIMP, ROUGH

.FL 2, 15 M .FW 0.3, 0.5 M .FD

.CL 2, 15 M .CW 0.3, 0.5 M .CD

.FCS 1.818 - 5(-3) .Q 5.3 - 126 -4 CUMECS .INST POINT GAUGE, PITOT TUBE

.AUTHOR IMAMOTO H, ISHIGAKI T

.PUB‘N KYOTO UNIV., DPRI, VOL4, 14, 1984

.TITLE BOUNDARY SHEAR STRESS MEASUREMENT USING HYDROGEN BUBBLE METHOD IN AN OPEN CHANNEL

.DATA BOUNDARY SHEAR STRESS, SHEAR STRESS CONTOURS

.KEY WORDS BOUNDART SHEAR STRESS, OPEN CHANNEL

.CHANNEL TYPE EXP, SIMP, COMP, SMOOTH

.FL .FW .FD

.CL .CW .CD

.FCS .Q .INST

AUTHOR IMAMOTO H, ISHIGAKI T, FUJISAWA H
PUB`N KYOTO UNIV., DPRI, NO 25, 1982
TITLE ON THE CHARACTERISTICS OF OPEN CHANNEL FLOW IN BEND WITH FLOODPLAINS
DATA ABSTRACT
KEY WORDS TURBULENCE, BEND, FLOODPLAIN
CHANNEL TYPE EXP, SMTH, COMP, BEND
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR IMAMOTO H, ISHIGAKI T, KINOSHITA S
PUB`N KYOTO UNIV., DPRI, NO 27, 1984
TITLE ON THE HYDRAULICS OF AN OPEN CHANNEL FLOW IN COMPLEX CROSS SECTION
DATA ABSTRACT
KEY WORDS BOUNDARY SHEAR STRESS, EDDY DISTRIBUTION
CHANNEL TYPE EXP, COMP, SMOOTH
FL
FW
FD
CL
CW
CD
FCS
Q
INST LASER DOPPLER ANEMOMETER, HOT FILM ANEMOMETER

AUTHOR IMAMOTO H, KUGE T
PUB`N KYOTO UNIV., DPRI, NO 17, 1974
TITLE ON THE CHARACTERISTICS OF AN OPEN CHANNEL FLOW IN COMPLEX CROSS SECTION
DATA ABSTRACT
KEY WORDS REYNOLDS STRESS, TURBULENT VELOCITY, SECONDARY FLOW
CHANNEL TYPE EXP, SMTH, COMP
FL
FW
FD
CL
CW
CD
FCS
Q
INST

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................................................................................
.AUTHOR IMAMOTO H, ISHIGAKI T                            .PUB`N KYOTO UNIV.,  .
.........................................................DPRI, NO 26, 1983    .
.TITLE EXP STUDY ON THE BOUNDARY SHEAR STRESS DIST. AND  .                     .
.LONGITUDINAL EDDIES IN OPEN CHAN. FLOW                  .                     .
................................................................................
.DATA ABSTRACT                                       .KEY WORDS BOUNDARY SHEAR .
.                                                    .STRESS, LONGITUDINAL     .
......................................................EDDIES                   .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                     .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST LASER DOPPLER ANEMOMETER      .
.                    .                     .                                   .
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.AUTHOR IMAMOTO H, ISHIGAKI T, INADA S                   .PUB`N KYOTO UNIV.,  .
..........................................................NO 25, 1982          .
.TITLE ON THE HYDRAULICS OF AN OPEN CHANNEL FLOW IN      .                     .
.COMPLEX CROSS SECTION                                   .                     .
................................................................................
.DATA ABSTRACT                                       .KEY WORDS TURBULENCE,    .
.                                                    .SECONDARY MOTION         .
......................................................                         .
.CHANNEL TYPE EXP, COMP, SMOOTH                      .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST HOT FILM ANEMOMETER,          .
.                    .                     .MINIATURE CURRENT METER            .
................................................................................


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.AUTHOR IMAMOTO H, ISHIGAKI T                            .PUB`N 5 TH CONG.     .
..........................................................IAHR, ASIAN &        .
.TITLE THE THREE DIMENSIONAL STRUCTURE OF TURBULENT      .PACIFIC REG DIV,     .
.SHEAR FLOW IN AN OPEN CHANNEL                           .AUG, 1986            .
................................................................................
.DATA VELOCITY PROFILES, TURBULENCE INTENSITIES,     .KEY WORDS TURBULENCE,    .
.REYNOLDS STRESS, SECONDARY FLOW VECTORS             .SHEAR STRESS             .
......................................................                         .
.CHANNEL TYPE EXP, SIMP, SMTH, RGH                   .                         .
................................................................................
.FL 6, 8 M               .FW 0.2, 0.4 M            .FD 0.15, 0.23 M            .
................................................................................
.CL 6, 8 M               .CW 0.2, 0.4 M            .CD 0.15, 0.23 M            .
................................................................................
.FCS 7.69 - 20(-4)   .Q 0.001473 -         .INST LASER DOPPLER VELOCIMETER     .
.                    .0.004354 CUMECS      .                                   .
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AUTHOR INDLEKOFER H, ROBINSON S, ROUVE G

PUB`N 9 TH CONG., INT COMMISSION ON IRRIGATION & DRAINAGE

TITLE TRANSPORT OF BED LOAD INTO CHANNEL BRANCHES & REGULATION BY INDUCING SECONDARY FLOW

DATA STREAMLINES, NEAR BOTTOM DIVISION LINES, SECONDARY FLOW

KEY WORDS SECONDARY FLOW, BED LOAD TRANSPORT

CHANNEL TYPE EXP, THRY, SIMP, RGH

FL 8 M
FW 0.03, 0.25 M
FD

CL 4 M
CW 0.03, 0.25 M
CD

FCS
Q 4 - 18 L/S
INST POINT GAUGE

AUTHOR van INGEN C

PUB`N CALIFORNIA INSTITUTE TECHNOLOGY, KH-R-42, OCT, 1981

TITLE OBSERVATIONS IN A SEDIMENT LADEN FLOW BY USE OF LASER DOPPLER VELOCIMETRY

DATA VELOCIMETRY DATA RECORD, VELOCITY PROFILES, PROBABILITY DENSITY FUNCTION, POWER SPECTRA

KEY WORDS SEDIMENT TRANSPORT, LASER DOPPLER VELOCIMETRY

CHANNEL TYPE EXP, SIMP, SMOOTH

FL 13 M
FW 0.267 M
FD 0.254 M

CL 13 M
CW 0.267 M
CD 0.254 M

FCS -1 to +38(-3)
Q 12.94 L/S
INST LASER DOPPLER ANEMOMETER

AUTHOR INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH

PUB`N IAHR, VOLUME 1 & 2 , SEPTEMBER, 1967

TITLE PROCEEDINGS, 12 TH CONGRESS, FORT COLLINS, SEPTEMBER, 1967

DATA PAPERS ON SECONDARY CURRENTS AND MACROTURBULENCE

KEY WORDS SECONDARY CURRENTS, MACROTURBULENCE

CHANNEL TYPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

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................................................................................
.AUTHOR IPPEN A T, DRINKER P A                           .PUB`N PASCE, J HYD   .
..........................................................D, VOL 88, HY5,      .
.TITLE BOUNDARY SHEAR STRESSES IN CURVED TRAPEZOIDAL     .SEPTEMBER, 1962      .
.CHANNELS                                                .                     .
................................................................................
.DATA VELOCITY DISTRIBUTION, WATER SURFACE PROFILE,  .KEY WORDS BOUNDARY SHEAR .
.BOUNDARY SHEAR STRESS, ENERGY DISSIPATION           .STRESS, CURVED           .
......................................................TRAPEZOIDAL CHANNELS     .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, BEND              .                         .
................................................................................
.FL 36 FT                .FW 5 FT                  .FD                         .
................................................................................
.CL 36 FT                .CW 12, 24 IN             .CD 5, 8 IN                 .
................................................................................
.FCS 6.4(-4)         .Q 0.19 - 2.86 CUSECS .INST PRESTON TUBE, PITOT TUBE,     .
.                    .                     .POINT GAUGES, MANOMETERS           .
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.AUTHOR JAMES M, BROWN B J                               .PUB`N USWES,         .
..........................................................RESEARCH REPORT      .
.TITLE GEOMETRIC PARAMETERS THAT INFLUENCE FLOODPLAIN    .H-77-1, JUNE, 1977   .
.FLOW                                                    .                     .
................................................................................
.DATA DISCHARGE, DEPTH, ASPECT RATIO, RESISTANCE     .KEY WORDS FLOODPLAINS,   .
.COEFF, VELOCITY RATIO, DEPTH RATIO, SLOPE           .OVERBANK FLOW,           .
......................................................RESISTANCE COEFFICIENT   .
.CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH               .                         .
................................................................................
.FL 88 FT                .FW 5 FT                  .FD 1.5 FT                  .
................................................................................
.CL 88 FT                .CW 6, 9.55 IN            .CD 2, 4 IN                 .
................................................................................
.FCS 1 - 3(-3)       .Q 0.101 - 0.676      .INST VENTURI METERS, POINT GAUGE,  .
.                    .CUSECS               .PITOT TUBE, TRANSDUCER, CAMERA     .
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.AUTHOR JAMES C S                                        .PUB`N J HYDRAULIC    .
..........................................................RESEARCH, VOL 23,    .
.TITLE SEDIMENT TRANSFER TO OVERBANK SECTIONS            .1985, NO 5           .
.                                                        .                     .
................................................................................
.DATA SEDIMENT DISTRIBUTION                          .KEY WORDS SEDIMENT       .
.                                                    .TRANSPORT, COMPOUND      .
......................................................CHANNEL                  .
.CHANNEL TYPE THRY, EXP, COMP, SMTH, RGH             .                         .
................................................................................
.FL 10 M                 .FW 380 MM                .FD                         .
................................................................................
.CL 10 M                 .CW 160 MM                .CD 105 MM                  .
................................................................................
.FCS 4(-3)           .Q 8.3 - 21.9 L/S     .INST                               .
.                    .                     .                                   .
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AUTHOR JOBSON H E, SAYRE W W

PUB`N PASCE, J HYD D, VOL 96, HY3, MARCH, 1970

TITLE VERTICAL TRANSFER IN OPEN CHANNEL FLOW

DATA MOMENTUM TRANSFER COEFF., CONCENTRATION PROFILES, SEDIMENT TRANSFER COEFF.

KEY WORDS MOMENTUM TRANSFER, OPEN CHANNEL

CHANNEL TYPE THRY, EXP, SIMPLE, ROUGH

FL 200 FT
FW 8 FT
FD 4 FT

CL 200 FT
CW 8 FT
CD 4 FT

FCS 5 - 47(-4)
Q 9.96 - 30.60 CUSECS
INST DYE, FLUOROMETER

AUTHOR JOHNSON J W

PUB`N CIVIL ENGINEERING, VOL 12, NO 6, JUNE, 1942

TITLE THE IMPORTANCE OF CONSIDERING SIDE WALL FRICTION IN BED LOAD INVESTIGATIONS

DATA FLOW SECTION SUB AREAS, SEDIMENT TRANSPORT, TEMPERATURE, TRACTIVE FORCE

KEY WORDS SIDE WALL FRICTION, BED LOAD TRANSPORT

CHANNEL TYPE THRY, EXP, SIMP, RGH

FL 52.5 FT
FW 16 IN
FD 22 IN

CL 52.5 FT
CW 16 IN
CD 22 IN

FCS 1(-2)
Q
INST

AUTHOR JONES O C

PUB`N TASME, J FLUIDS ENG., JUNE, 1976

TITLE AN IMPROVEMENT IN THE CALCULATION OF TURBULENT FRICTION IN RECTANGULAR DUCTS

DATA FRICTION FACTOR, REYNOLDS NO, ASPECT RATIO, INVERSE ASPECT RATIO

KEY WORDS TURBULENT FRICTION, DUCT

CHANNEL TYPE EXP, SIMP, SMTH, DUCT, PIPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR JONES O C, LEUNG J C M

PUB'N TASME, J FLUIDS ENG., VOL 103, DECEMBER, 1981

TITLE AN IMPROVEMENT IN THE CALCULATION OF TURBULENT FRICTION IN SMOOTH CONCENTRIC ANNULI

DATA FRICTION FACTOR, REYNOLDS NO, RADIUS RATIO, COLEBROOK-WHITE

KEY WORDS TURBULENT FRICTION, SMOOTH CONCENTRIC ANNULI

CHANNEL TYPE THRY, EXP, SMTH, ANNULI

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR JONSSON L

PUB'N LUND INSTITUTE OF TECHNOLOGY, SERIES A, 32, 1974

TITLE LASER VELOCITY METER FOR WATER FLOW

DATA

KEY WORDS LASER DOPPLER

CHANNEL TYPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST LASER DOPPLER

AUTHOR JURISCH R

PUB'N IAHR CONGRESS, 1973, ISTANBUL, 15 TH CONGRESS

TITLE INSTANTANEOUS VELOCITY MEASUREMENTS IN HYDRAULIC MODELS BY LASER DOPPLER ANEMOMETRY

DATA MEAN VELOCITY, ROOT MEAN SQUARE VELOCITY, DEPTH, FREQUENCY SPECTRUM

KEY WORDS LASER DOPPLER ANEMOMETRY, VELOCITY MEASUREMENT

CHANNEL TYPE EXP, SIMPLE, ROUGH

FL
FW 5 M
FD

CL
CW 5 M
CD

FCS
Q
INST LASER DOPPLER ANEMOMETER (1 COMPONENT)

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................................................................................
.AUTHOR KALKWIJK J P Th, de VRIEND H J                   .PUB`N DELFT          .
..........................................................UNIVERSITY OF        .
.TITLE COMPUTATION OF THE FLOW IN SHALLOW RIVER BENDS    .TECHNOLOGY, REPORT   .
.                                                        .80 - 1               .
................................................................................
.DATA SECONDARY FLOW, FRICTION FACTOR, TRANSVERSE    .KEY WORDS MATHEMATICAL   .
.MOMENTUM EXCHANGE, VELOCITY, WATER LEVEL            .MODEL, STEADY FLOW, BEND .
......................................................                         .
.CHANNEL TYPE THRY, EXP, RGH, BEND, SIMP             .                         .
................................................................................
.FL 118 M                .FW 6 M                   .FD                         .
................................................................................
.CL 118 M                .CW 6 M                   .CD                         .
................................................................................
.FCS                 .Q 0.212 - 0.463      .INST                               .
.                    .CUMECS               .                                   .
................................................................................


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.AUTHOR KARASEV I F                                      .PUB`N SOVIET         .
..........................................................HYDROLOGY, 5, 1969   .
.TITLE INFLUENCE OF THE BANKS AND FLOOD PLAIN ON CHANNEL .                     .
.CONVEYANCE                                              .                     .
................................................................................
.DATA ROUGHNESS COEFF., VELOCITY VECTORS, VELOCITY   .KEY WORDS FLOW           .
.RATIO, REL. DEPTH RATIO, VEL DISTRIBUTION           .INTERACTION, COMPOUND    .
......................................................CHANNEL                  .
.CHANNEL TYPE PROTO, EXP, COMP, SMTH, RGH            .                         .
................................................................................
.FL                      .FW 0.4, 1.21 M           .FD 0.04, 0.12 M            .
................................................................................
.CL                      .CW 25, 110 M             .CD 1.6, 5.4 M              .
................................................................................
.FCS 1.7 - 300(-4)   .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR KARTHA V C, LEUTHEUSSER H J                      .PUB`N PASCE, J HYD   .
..........................................................D, VOL 96, HY7,      .
.TITLE DISTRIBUTION OF TRACTIVE FORCE IN OPEN CHANNELS   .JULY, 1970           .
.                                                        .                     .
................................................................................
.DATA TRACTIVE FORCE, ASPECT RATIO,                  .KEY WORDS TRACTIVE       .
.                                                    .FORCE, OPEN CHANNELS     .
......................................................                         .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH                    .                         .
................................................................................
.FL 50 FT                .FW 15.25 IN              .FD 2 FT                    .
................................................................................
.CL 36 FT                .CW 15.25 IN              .CD 2 FT                    .
................................................................................
.FCS                 .Q                    .INST PRESTON TUBE, PRES TAPPINGS, F.
.                    .                     .LOW MTR, ADJ WEIR, PT GAUGE, MANOMT.
................................................................................
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AUTHOR KAZEMIPOUR A K, APELT C J

PUB`N J HYDRAULIC RESEARCH, 20, 1982, NO 3

TITLE NEW DATA ON SHAPE EFFECTS IN SMOOTH RECTANGULAR CHANNELS

DATA FRICTION FACTOR, REYNOLDS, ASPECT RATIO

KEY WORDS ASPECT RATIO, SMOOTH RECTANGULAR CHANNELS

CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 25 M
FW 1.2 M
FD

CL 20 M
CW 0.40 M
CD 0.30 M

FCS 5.7 - 60.6(-4)
Q 6.12 - 55.78 L/S
INST ADJ. GATE, SLUICE, POINT GAUGES, ORIFICE

AUTHOR KAZEMIPOUR A K, APELT C J

PUB`N J HYDRAULIC RESEARCH, 17, 1979, NO 2

TITLE SHAPE EFFECTS ON RESISTANCE TO UNIFORM FLOW IN OPEN CHANNELS

DATA SHAPE CORRECTION FACTOR, FRICTION FACTOR, ASPECT RATIO

KEY WORDS SHAPE EFFECTS, RESISTANCE, UNIFORM FLOW, OPEN CHANNEL

CHANNEL TYPE THRY, EXP, SIMP, SMTH, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR KELLER R J, RODI W

PUB`N HYDROSOFT, 1984

TITLE PREDICTION OF 2 DIMENSIONAL FLOW CHARACTERISTICS IN COMPLEX CROSS SECTIONS

DATA VELOCITY, BED SHEAR STRESS

KEY WORDS COMPOUND CHANNEL, TWO DIMENSIONAL FLOW

CHANNEL TYPE THRY, EXP, COMP, SMTH, RGH

FL
FW 1.22 M
FD

CL
CW 0.204, 0.71 M
CD 0.0826, 0.0975 M

FCS 4.8 - 9.4(-4)
Q 0.0091 - 0.030 CUMECS
INST

AUTHOR KIKKAWA H, IKEDA S, KITAGAWA A

PUB`N PASCE, J HYD D, VOL 102, HY9, SEPT, 1976

TITLE FLOW AND BED TOPOGRAPHY IN CURVED OPEN CHANNELS

DATA SCOUR, BED SHEAR STRESS, VELOCITY PROFILES, EDDY VISCOSITY, BED PROFILE

KEY WORDS FLOW, BED TOPOGRAPHY, CURVED OPEN CHANNELS

CHANNEL TYPE THRY, EXP, SIMP, BEND, RGH

FL 21.629 M   FW 1.0 M   FD

CL 21.629 M   CW 1.0 M   CD

FCS 2(-3)   Q 20 - 30 L/S   INST PITOT TUBE, WEIR, ADJ. TAILGATE

AUTHOR KIM H T, KLINE S J, REYNOLDS W C

PUB`N J FLUID MECH, 50, 1, 1971

TITLE THE PRODUCTION OF TURBULENCE NEAR A SMOOTH WALL IN A TURBULENT BOUNDARY LAYER

DATA VORTICITY & VEL PROFILES, REYNOLDS STRESS, AUTO CORRELATION COEFF, BURST FREQUENCY

KEY WORDS TURBULENCE, BOUNDARY LAYER

CHANNEL TYPE EXP, SIMP, SMTH

FL   FW 3 FT   FD 10 IN

CL   CW 3 FT   CD 10 IN

FCS   Q   INST HYDROGEN BUBBLE METHOD, HOT WIRE ANEMOMETER

AUTHOR KINGHORN F C, McHUGH A, DUNCAN W

PUB`N WATER POWER, SEPTEMBER, 1973

TITLE AN EXPERIMENTAL COMPARISON OF TWO VELOCITY AREA NUMERICAL INTEGRATION TECHNIQUES

DATA MASS FLOW RATE, REYNOLDS NO, VELOCITY, VELOCITY DISTRIBUTION LAW

KEY WORDS VELOCITY AREA PLOTS, NUMERICAL INTEGRATION METHODS

CHANNEL TYPE EXP, SIMP, SMTH, PIPE

FL 11.332 M   FW 0.203 M DIA.   FD

CL 0.203 M   CW 0.203 M DIA   CD

FCS   Q AIR, 7.157 - 22.06(-4)CUMECS   INST PITOT TUBE

AUTHOR LE VAN KIYEN

PUB`N SOVIET HYDROLOGY, 4, 1968

TITLE HYDRAULIC COMPUTATION OF FLOODPLAIN CHANNELS

DATA

KEY WORDS COMPOUND CHANNEL, FLOW COMPUTATION

CHANNEL TYPE THRY, EXP, PROTO, COMP, RGH

FL FW FD

CL CW CD

FCS Q INST

AUTHOR KLAASSEN G J, VAN DER ZWAARD J J

PUB`N J HYDRAULIC RESEARCH, 12, 1974, 1

TITLE ROUGHNESS COEFFICIENTS OF VEGETATED FLOODPLAINS

DATA DEPTH, CHEZY COEFF, DRAG COEFF, REYNOLDS NO, BED ROUGHNESS COEFF, VELOCITY, DISCHARGE

KEY WORDS ROUGHNESS COEFFICIENTS, VEGETATED FLOODPLAINS

CHANNEL TYPE PROTO, EXP, SIMP, ROUGH

FL -, 100 M FW 3, 3 M FD -, 3 M

CL 20, 40 M CW 3, 3 M CD

FCS Q 0 - 16 CUMECS INST CURRENT METER, PITOT TUBE

AUTHOR KLEIN A

PUB`N TASME, J FLUIDS ENG., VOL 103, JUNE, 1981

TITLE REVIEW:TURBULENT DEVELOPING PIPE FLOW

DATA NON DIMENSIONAL DISTANCE, VEL. PROFILE, BLOCKAGE RATIO, TURBULENCE INTENSITY, REYNOLDS NO

KEY WORDS TURBULENT FLOW, REYNOLDS NO, BLOCKAGE FACTOR

CHANNEL TYPE THRY, EXP, SMTH, RGH, PIPE

FL FW FD

CL CW CD

FCS Q INST

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................................................................................
.AUTHOR KNIGHT D W, DEMETRIOU J D, HAMED M E             .PUB`N SYMP,CH AND CH .
..........................................................CONT STR,            .
.TITLE STAGE DISCHARGE RELATIONSHIPS FOR COMPOUND        .SOUTHAMPTON, APRIL,  .
.CHANNELS                                                .1984                 .
................................................................................
.DATA DIMENSIONLESS WIDTH, DEPTH, ROUGHNESS, CHAN    .KEY WORDS STAGE          .
.SHAPE RATIOS, ROUGHNESS SEPN AND HEIGHT             .DISCHARGE, COMPOUND      .
......................................................CHANNEL                  .
.CHANNEL TYPE EXP, COMP, ROUGH, SMOOTH               .                         .
................................................................................
.FL 15 M                 .FW 0.61 M                .FD                         .
................................................................................
.CL 15 M                 .CW 0.152 M               .CD 0.076 M                 .
................................................................................
.FCS 9.66(-4)        .Q 4.8 - 29.4 L/S     .INST PRESTON TUBE, MINIATURE       .
.                    .                     .CURRENT METER, ADJ WEIR            .
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.AUTHOR KNIGHT D W, DEMETRIOU J D, HAMED M E             .PUB`N SYMP,HYD ASP   .
..........................................................FLOODS     & FLOOD   .
.TITLE HYDRAULIC ANALYSIS OF CHANNELS WITH FLOOD PLAINS  .CONT, BHRA, LONDON,  .
.                                                        .1983                 .
................................................................................
.DATA DIMENSIONLESS WIDTH, DEPTH, ROUGHNESS, CHANNEL .KEY WORDS BOUNDARY       .
.SHAPE RATIOS, APPARENT SHEAR, ISOVELS               .SHEAR, COMPOUND CHANNELS .
......................................................                         .
.CHANNEL TYPE EXP, COMP, ROUGH, SMOOTH               .                         .
................................................................................
.FL 15 M                 .FW 0.61 M                .FD                         .
................................................................................
.CL 15 M                 .CW 0.152 M               .CD 0.076 M                 .
................................................................................
.FCS 9.66(-4)        .Q                    .INST PRESTON TUBE, MINIATURE       .
.                    .                     .CURRENT METER                      .
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.AUTHOR KNIGHT D W, LAI C J                              .PUB`N SYMP,REF FLOW  .
..........................................................MOD AND TUR MEAS,    .
.TITLE TURBULENT FLOW IN COMPOUND CHANNELS AND DUCTS     .IOWA, SEPT, 1985     .
.                                                        .                     .
................................................................................
.DATA BED SHEAR, WALL SHEAR, ISOVELS, BOUNDARY SHEAR .KEY WORDS TURBULENT      .
.                                                    .FLOW, COMPOUND CHANNELS, .
......................................................DUCTS                    .
.CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH               .                         .
................................................................................
.FL 17 M                 .FW 0.38 M                .FD 0.1035 M                .
................................................................................
.CL 17 M                 .CW 0.077 M               .CD 0.041, 0.1035 M         .
................................................................................
.FCS                 .Q AIR                .INST PITOT TUBE, PRESTON TUBE      .
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.AUTHOR KNIGHT D W, PATEL H S, DEMETRIOU J D, HAMED M E  .PUB`N EUROMECH 156, .
........................................................MECH OF SED          .
.TITLE BOUNDARY SHEAR STRESS DISTRIBUTIONS IN OPEN      .TRANSPORT, ISTANBUL, .
.CHANNEL AND CLOSED CONDUIT FLOWS                       .1982                 .
.....................................................................
.DATA BED SHEAR, WALL SHEAR, ASPECT RATIO            .KEY WORDS BOUNDARY SHEAR .
.                                                    .STRESS, OPEN CHANNEL,    .
.....................................................CLOSED CONDUITS          .
.CHANNEL TYPE EXP, OPEN, DUCT, SMTH, COMP            .                         .
.....................................................................
.FL 15, 15, 17 M         .FW 0.61, 0.46, 0.4 M     .FD -, -, 0.165 M           .
.....................................................................
.CL 15, 15, 9.25 M       .CW                       .CD                         .
.....................................................................
.FCS 9.5 - 9.7(-4)    .Q                .INST PRESTON TUBE, PRES TAPPINGS,     .
.                     .                 .ORIFICE PLATE, MIN CURRENT-METER      .
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.AUTHOR KNIGHT D W, MACDONALD J A                       .PUB`N PASCE, J HYD   .
........................................................D, VOL 105, HY9,      .
.TITLE OPEN CHANNEL FLOW WITH VARYING BED ROUGHNESS     .SEPTEMBER, 1979      .
.                                                       .                     .
.....................................................................
.DATA BED SHEAR, WALL SHEAR, DEPTH/WIDTH RATIO,      .KEY WORDS OPEN CHANNEL,  .
.WALL/BED VEL RATIOS                                 .VAR BED ROUGHNESS, SHEAR .
.....................................................FORCE/STRESS             .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                     .                         .
.....................................................................
.FL 15 M                 .FW 0.46 M                .FD 0.38 M                  .
.....................................................................
.CL 15 M                 .CW 0.46 M                .CD 0.38 M                  .
.....................................................................
.FCS 9.58(-4)         .Q 3.0 - 113.6 L/S .INST PRESTON TUBE, MIN CURRENT METE.
.                     .                  .R, VENTURI, DALL TUBE, MANOMETER    .
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.AUTHOR KNIGHT D W, DEMETRIOU J D, HAMED M E            .PUB`N PASCE, J HYD   .
........................................................ENG, VOL 110, 4,      .
.TITLE BOUNDARY SHEAR IN SMOOTH RECTANGULAR CHANNELS    .APRIL, 1984          .
.                                                       .                     .
.....................................................................
.DATA BED/WALL SHEAR STRESS, BREADTH/DEPTH RATIO, %  .KEY WORDS BOUNDARY SHEAR .
.SHEAR FORCE, BOUNDARY SHEAR DISTRIBUTION            .STRESS/FORCE, RECT       .
.....................................................SMOOTH CHANNEL           .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH                    .                         .
.....................................................................
.FL 15 M                 .FW 0.610 M               .FD                         .
.....................................................................
.CL 15 M                 .CW 0.07, 0.61M           .CD                         .
.....................................................................
.FCS 9.66(-4)         .Q 1.98 - 28.66 L/S .INST PRESTON TUBE, MIN CURRENT METE.
.                     .                   .R, POINT GAUGES, MANOMETER, VENTURI.
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.AUTHOR KNIGHT D W, PATEL H S

.PUB`N PASCE, J HYD ENG, VOL 111, 1, JANUARY, 1985

.TITLE BOUNDARY SHEAR IN SMOOTH RECTANGULAR DUCTS

.DATA BED/WALL SHEAR STRESS, ASPECT RATIO, BED/WALL SHEAR VARIATION

.KEY WORDS BOUNDARY SHEAR, SMOOTH RECT DUCT, SECONDARY CELLS

.CHANNEL TYPE EXP, DUCT, RECT, SMOOTH

.FL 17 M .FW 0.4 M .FD 0.2 M

.CL 9.25 M .CW 0.165, 0.4 M .CD 0.04, 0.165 M

.FCS .Q AIR .INST PITOT TUBE, PRESTON TUBE, ORIFICE, PRES TAPPINGS, MANOMETER

.AUTHOR KNIGHT D W, HAMED M E

.PUB`N PASCE, J HYD ENG, VOL 110, 10, OCTOBER, 1984

.TITLE BOUNDARY SHEAR IN SYMMETRICAL COMPOUND CHANNELS

.DATA DIMENSIONLESS WIDTH, DEPTH, CHAN SHAPE, ROUGHNESS RATIOS, APP SHEAR, BOUNDARY SHEAR FORCE

.KEY WORDS BOUNDARY SHEAR STRESS, SHEAR FORCE, SYM COMP CHANNELS

.CHANNEL TYPE EXP, COMP, ROUGH

.FL 15 M .FW 0.61 M .FD

.CL 15 M .CW 0.152 M .CD 0.076 M

.FCS 9.66(-4) .Q 4.25 - 29.4 L/S .INST PRESTON TUBE, MIN CURRENT METER

.AUTHOR KNIGHT D W, DEMETRIOU J D

.PUB`N PASCE, J HYD ENG, VOL 109, 8, AUGUST, 1983

.TITLE FLOOD PLAIN AND MAIN CHANNEL FLOW INTERACTION

.DATA DIMENSIONLESS DEPTH RATIO, % SHEAR FORCE, APPARENT SHEAR FORCE, FLOW DISTRIBUTION

.KEY WORDS BOUNDARY SHEAR FORCE, SHEAR STRESS, FLOW INTERACTION

.CHANNEL TYPE EXP, SIMPLE, COMP, SMOOTH

.FL 15 M .FW 0.61 M .FD

.CL 15 M .CW 0.152 M .CD 0.076 M

.FCS 9.66(-4) .Q 4.8 - 29.4 L/S .INST PRESTON TUBE, MIN CURRENT METER, VENTURI, POINT GAUGES, MANOMETER.

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.AUTHOR KNIGHT D W, MACDONALD J W                        .PUB`N PASCE, J HYD   .
..........................................................D, VOL 105, HY6,     .
.TITLE HYDRAULIC RESISTANCE OF ARTIFICIAL STRIP          .JUNE, 1979           .
.ROUGHNESS                                               .                     .
................................................................................
.DATA ASPECT, RELATIVE ROUGHNESS, ROUGHNESS SPACING  .KEY WORDS ARTIFICIAL     .
.RATIOS, FRICTION FACTOR                             .STRIP ROUGHNESS, FLOW    .
......................................................PATTERNS, SHEAR          .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH             .                         .
................................................................................
.FL 15.25 M              .FW 0.46 M                .FD 0.38 M                  .
................................................................................
.CL 15.25 M              .CW 0.46 M                .CD 0.38 M                  .
................................................................................
.FCS 9.58(-4)        .Q 0 - 180 L/S        .INST PRESTON TUBE,  CURRENT MTR, VE.
.                    .                     .NTURI, DALL TUBE, MANOMTR, PRES TAP.
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.AUTHOR KNIGHT D W, PATEL H S                            .PUB`N SYM, REF FLOW  .
..........................................................MOD AND TURB MEAS,   .
.TITLE BOUNDARY SHEAR STRESS DISTRIBUTIONS IN            .IOWA, SEPT, 1985     .
.RECTANGULAR DUCT FLOW                                   .                     .
................................................................................
.DATA BED SHEAR STRESS, ASPECT RATIO                 .KEY WORDS BOUNDARY       .
.                                                    .SHEAR, RECTANGULAR DUCT  .
......................................................                         .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, DUCT              .                         .
................................................................................
.FL 17 M                 .FW 0.4 M                 .FD 0.2 M                   .
................................................................................
.CL 9.25 M               .CW 0.165, 0.4 M          .CD 0.04, 0.165 M           .
................................................................................
.FCS                 .Q AIR                .INST PRESTON TUBE, ORIFICE,        .
.                    .                     .PRESSURE TAPPINGS                  .
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.AUTHOR KNIGHT D W                                       .PUB`N PASCE, J HYD   .
..........................................................D, VOL 107, HY7,     .
.TITLE BOUNDARY SHEAR IN SMOOTH AND ROUGH CHANNELS       .JULY, 1981           .
.                                                        .                     .
................................................................................
.DATA SHEAR FORCE, ROUGHNESS RATIOS, ASPECT RATIO,   .KEY WORDS BOUNDARY       .
.WALL SHEAR STRESS, BED SHEAR STRESS                 .SHEAR, ROUGH CHANNEL,    .
......................................................SMOOTH CHANNEL           .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH             .                         .
................................................................................
.FL 15 M                 .FW 0.46 M                .FD                         .
................................................................................
.CL 15 M                 .CW 0.46 M                .CD                         .
................................................................................
.FCS 9.58(-4)        .Q 3 - 113.6 L/S      .INST PRESTON TUBE                  .
.                    .                     .                                   .
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AUTHOR KNIGHT D W, MACDONALD J A

PUB`N PASCE, J HYD D, VOL 107, HY5, MAY, 1981

TITLE OPEN CHANNEL FLOW WITH VARYING BED ROUGHNESS (CLOSURE)

DATA

KEY WORDS OPEN CHANNEL, VARYING BED ROUGHNESS

CHANNEL TYPE EXP, SIMP, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR KNIGHT D W, DEMETRIOU J D

PUB`N PASCE, J HYD D, VOL 112, NO 11, NOVEMBER, 1986

TITLE FLOOD PLAIN AND MAIN CHANNEL FLOW INTERACTION (CLOSURE)

DATA

KEY WORDS APPARENT SHEAR FORCE, ASPECT RATIO, DEPTH RATIO

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR KOLOSEUS H J, DAVIDIAN J

PUB`N US GEOL SURVEY WATER SUPPLY PAPER 1592 C, 1966

TITLE FREE SURFACE INSTABILITY CORRELATIONS

DATA FROUDE, RESISTANCE COEFF, DEPTH, INSTABILITY RATIO, DISCHARGE, ROLL WAVE DEVT/DEPTH RATIO

KEY WORDS FREE SURFACE INSTABILITY, ROLL WAVES

CHANNEL TYPE EXP, SIMP, SMTH, RGH, THRY

FL 30, 85 FT	FW 2, 2.5 FT	FD
CL 30, 85 FT	CW 2, 2.5 FT	CD
FCS 4.3 - 685(-4)	Q 0.0247 - 1.755 CUSECS	INST VIBRATING NEEDLE GAUGE, PIEZOMETER TAPPING

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.AUTHOR KOLOSEUS H J, DAVIDIAN J                         .PUB`N US GEOL SURVEY .
..........................................................WATER SUPPLY PAPER   .
.TITLE ROUGHNESS CONCENTRATION EFFECTS ON FLOW OVER      .1592 C, 1966         .
.HYDRODYNAMICALLY ROUGH SURFACES                         .                     .
................................................................................
.DATA ROUGHNESS HEIGHT RATIO, ROUGHNESS              .KEY WORDS RESISTANCE     .
.CONCENTRATION FACTOR                                .COEFFICIENT, ROUGHNESS   .
......................................................ELEMENT CONC             .
.CHANNEL TYPE EXP, SIMP, SMTH, RGH, THRY             .                         .
................................................................................
.FL 30, 85 FT            .FW 2, 2.5 FT             .FD                         .
................................................................................
.CL 30, 85 FT            .CW 2, 2.5 FT             .CD                         .
................................................................................
.FCS 4.3 - 685(-4)   .Q 0.0247 - 1.755     .INST VIBRATING NEEDLE GAUGE,       .
.                    .CUSECS               .PIEZOMETER TAPPING                 .
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.AUTHOR KOMATSU T, KOTSUBO H, UMENAGA S                  .PUB`N 5 TH CONG.     .
..........................................................IAHR, ASIAN &        .
.TITLE CHARACTERISTICS OF LARGE VORTICAL STRUCTURE IN    .PACIFIC REG DIV,     .
.MIXING SHEAR FLOW AND ITS HYDRAULIC ROLES               .AUG, 1986            .
................................................................................
.DATA VORTICITY PERIOD, TURBULENCE COMPONENTS, PHASE .KEY WORDS VORTICES,      .
.VELOCITY, REYNOLDS STRESS, TIME SPECTRA             .SHEAR FLOW               .
......................................................                         .
.CHANNEL TYPE EXP, SIMP, SMTH                        .                         .
................................................................................
.FL 5 M                  .FW 0.15 M                .FD 0.4 M                   .
................................................................................
.CL 5 M                  .CW 0.15 M                .CD 0.4 M                   .
................................................................................
.FCS HORIZONTAL      .Q 0.001444 CUMECS    .INST HOT FILM ANEMOMETER, DYE,     .
.                    .                     .CAMERA                             .
................................................................................


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.AUTHOR KOMORA J                                         .PUB`N IAHR, 1973,    .
..........................................................ISTANBUL, 15 TH      .
.TITLE HYDRAULIC RESISTANCE TO FLOW IN CHANNELS          .CONGRESS             .
.                                                        .                     .
................................................................................
.DATA ISOVELS, ASPECT RATIO, SHEAR STRESS            .KEY WORDS FLOW           .
.                                                    .RESISTANCE, OPEN         .
......................................................CHANNELS                 .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                     .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW 0.1, 1.25 M           .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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AUTHOR KOMORA J

PUB`N VYSKUMNY USTAV VODNEHO HOSPODARSTVA, BRATISLAVA, 80, 1976

TITLE DISTRIBUTION OF VELOCITIES & SHEAR STRESSES IN OPEN CHANNELS (IN CZECHOSLOVAK)

DATA VEL PROFILE, ISOVELS, SHEAR STRESS, ASPECT RATIO, SIDE SLOPE, SHEAR VELOCITY

KEY WORDS OPEN CHANNELS, SHEAR STRESS

CHANNEL TYPE EXP, THRY, SIMP, SMTH, RGH

FL 15 M
FW
FD

CL 15 M
CW 0.10, 1.25 M
CD

FCS 0.5 - 1(-2)
Q
INST

AUTHOR KONEMANN N

PUB`N INSTITUT FUR WASSERBAU, DARMSTADT, 25, 1980

TITLE INTERACTION OF CHANNEL AND FLOODPLAIN FLOW UPON RESISTANCE IN COMPOUND CHANNELS (GERMAN)

DATA VELOCITY AND DEPTH RATIOS, VELOCITY PROFILES, SHEAR STRESS, REYNOLDS, FRICTION FACTOR

KEY WORDS INTERACTION, COMPOUND CHANNELS, SHEAR STRESS

CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH

FL 50 M
FW 1 M
FD 0.455 M

CL 40 M
CW 0.5 M
CD 0.05, 0.1 M

FCS 0.5 - 2(-3)
Q 10.27 - 43.58 L/S
INST MIN CURRENT METER, LASER DOPPLER AND HOT FILM ANEMOMETER, PITOT

AUTHOR KONEMANN N

PUB`N PASCE, J HYD D, VOL 108, HY3, MARCH, 1982

TITLE MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN CHANNEL (DISCUSSION)

DATA

KEY WORDS SPECIFIC ENERGY, OPEN CHANNEL, COMPOUND

CHANNEL TYPE THRY, EXP, COMP, SMTH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR KOSORIN K

PUB`N IAHR, 1983, MOSCOW, VOL 5, SEPT, PROC 20 TH CONG

TITLE TURBULENT SHEAR STRESS AND VELOCITY DISTRIBUTION IN VEGETATED ZONE OF OPEN CHANNEL

DATA VELOCITY, SHEAR STRESS, WEED DEPTH, FLOW DEPTH, VEGETATION DENSITY, ROUGHNESS DIAMETER

KEY WORDS SHEAR STRESS, VEGETATION, OPEN CHANNEL

CHANNEL TYPE THEORY, EXP, SIMPLE, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST MIN CURRENT METER, DRAG BALANCE

AUTHOR KRADOLFER W

PUB`N VERSUCHSANSTALT FUR WASSERBAU, ZURICH, 1983

TITLE COMPUTATION OF DISCHARGE IN CHANNELS OF SIMPLE AND COMPOUND CROSS SECTION (GERMAN)

DATA FRICTION FACTOR, REYNOLDS, VELOCITY, HYDRAULIC RADIUS, BED SHEAR, FROUDE, CRITICAL DEPTH

KEY WORDS COMPOUND CHANNEL, DISCHARGE, COMPUTATION

CHANNEL TYPE EXP, PRO, SIM, COM, RGH, SM

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR KRAUSE D

PUB`N BERLIN TECHNICAL UNIVERSITY, REPORT 70, 1969

TITLE VELOCITY DISTRIBUTION AND ENERGY LOSS IN TURBULENT FLOW IN PIPES AND CHANNELS (GERMAN)

DATA FRICTION FACTOR, REYNOLDS, DIFFUSION COEFFICIENT, SECONDARY FLOW & BURSTING COEFFICIENTS

KEY WORDS VELOCITY DISTRIBUTION, ENERGY LOSS, PIPES, CHANNELS

CHANNEL TYPE EXP, SIMPLE, SMTH, RGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR KRISHNAPPAN B G, LAU Y L

TITLE TURBULENCE MODELING OF FLOOD PLAIN FLOWS

PUB`N PASCE, J HYD D, VOL 112, HY4, APRIL, 1986

DATA PREDICTED/MEASURED SHEAR STRESS; FLOW RATES; % TOTAL FLOW CARRIED BY MAIN CHANNEL

KEY WORDS TURBULENCE MODELING, FLOODPLAIN FLOWS

CHANNEL TYPE THRY, EXP, COMP, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR KROGSTAD P A, FANNELOP T K

TITLE EFFECT OF ROUGHNESS ON THREE DIMENSIONAL TURBULENT BOUNDARY LAYERS

PUB`N NORWEGIAN MARATIME RESEARCH, 3, 1983

DATA LAW OF THE WALL PLOT, WAKE PLOT, CROSSFLOW ANGLES, POLAR PLOT

KEY WORDS BOUNDARY LAYER, THREE DIMENSIONAL FLOW, ROUGHNESS

CHANNEL TYPE EXP, SIMP, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST PITOT TUBE, PRESTON TUBE, HOT WIRE ANEMOMETER, YAW TUBE

AUTHOR KUIPERS J, VREUGDENHIL C B

TITLE CALCULATIONS OF TWO DIMENSIONAL HORIZONTAL FLOW

PUB`N DELFT HYDRAULICS LABORATORY, S 163, 1, OCT, 1973

DATA FLOW PATTERN, VELOCITY DISTRIBUTION, CONVECTION TERM, WATER LEVEL

KEY WORDS CALCULATION, SECONDARY FLOW, EFFECTIVE VISCOSITY

CHANNEL TYPE THRY, EXP, SMTH, RGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

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................................................................................
.AUTHOR LAMONT P A                                       .PUB`N PICE, 1,       .
..........................................................APRIL, 1954, PAPER   .
.TITLE A REVIEW OF PIPE FRICTION DATA AND FORMULAE       .5993                 .
.                                                        .                     .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO, RELATIVE         .KEY WORDS PIPE FRICTION, .
.ROUGHNESS                                           .RELATIVE ROUGHNESS,      .
......................................................REYNOLDS NO              .
.CHANNEL TYPE EXP, SIMP, SMTH, RGH, PIPE             .                         .
................................................................................
.FL                      .FW 0.24, 46.25 IN DIAM   .FD                         .
................................................................................
.CL                      .CW 0.24, 46.25 IN        .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR LANGBEIN W B, LEOPOLD L B                        .PUB`N U.S. GEOL      .
..........................................................SURVEY PROFESSIONAL  .
.TITLE RIVER MEANDERS - THEORY OF MINIMUM VARIANCE       .PAPER 442, 1966      .
.                                                        .                     .
................................................................................
.DATA ANGLE, DISTANCE, SHEAR, FRICTION FACTOR,       .KEY WORDS MEANDAERS,     .
.SINUOSITY                                           .SINE GENERATED CURVE     .
......................................................                         .
.CHANNEL TYPE PROTO, SIMP, RGH, MEANDER              .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR LANSFORD W M, MITCHELL W D                       .PUB`N ILLINOIS       .
..........................................................UNIVERSITY ENG EXP   .
.TITLE AN INVESTIGATION OF THE BACKWATER PROFILE FOR     .STN, NO 381, 1949    .
.STEADY FLOW IN PRISMATIC CHANNELS                       .                     .
................................................................................
.DATA BACKWATER PROFILES, ISOVELS                    .KEY WORDS BACKWATER      .
.                                                    .PROFILE, STEADY FLOW,    .
......................................................PRISMATIC CHANNEL        .
.CHANNEL TYPE EXP, SIMP, COMP, SMTH                  .                         .
................................................................................
.FL 163.7 FT             .FW 5 FT                  .FD 4.75 FT                 .
................................................................................
.CL 135 FT               .CW 5 FT                  .CD 4.75 FT                 .
................................................................................
.FCS 3(-3)           .Q 0.79 - 40.4 CUSECS .INST CURRENT METER, PITOT TUBE     .
.                    .                     .                                   .
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AUTHOR LARSSON R

PUB`N PASCE, J HYD D, VOL 112, NO 8, AUGUST, 1986

TITLE CORIOLIS GENERATED SECONDARY CURRENTS IN CHANNELS

DATA SECONDARY VELOCITY, ROSSBY NO , ASPECT RATIO, NON DIMENSIONAL DISTANCE, DEPTH, VELOCITY

KEY WORDS OPEN CHANNELS, CORIOLIS, SECONDARY CURRENTS

CHANNEL TYPE THRY, EXP, SIMP

FL	FW	FD
CL	CW	CD

FCS	Q	INST

AUTHOR LAU Y L, KRISHNAPPAN B G

PUB`N PASCE, J HYD D, VOL 103, HY10, OCTOBER, 1977

TITLE TRANSVERSE DISPERSION IN RECTANGULAR CHANNELS

DATA DISPERSION COEFFICIENT, WIDTH - DEPTH RATIO, FRICTION FACTOR, DEPTH

KEY WORDS TRANSVERSE DISPERSION, RECTANGULAR CHANNELS

CHANNEL TYPE EXP, SIMPLE, ROUGH, SMOOTH

FL 30.7 M	FW 0.60 M	FD
CL 30.7 M	CW 0.3, 0.6 M	CD

FCS	Q	INST CONDUCTIVITY PROBE, TRACER

AUTHOR LAUFER J

PUB`N NACA, REPORT 1053, 1951

TITLE INVESTIGATION OF TURBULENT FLOW IN A TWO DIMENSIONAL CHANNEL

DATA SHEAR DISTRIBUTION, CORRELATION COEFFICIENT, SPECTRUM MEASUREMENT, REYNOLDS NO EFFECT

KEY WORDS TURBULENT FLOW

CHANNEL TYPE EXP, SMOOTH, DUCT

FL 23 FT	FW 60 IN	FD 3, 5 IN
CL 16 FT	CW 60 IN	CD 5 IN

FCS	Q AIR	INST HOT WIRE ANEMOMETER, PITOT TUBE

AUTHOR LAUNDER B E, YING W M

PUB`N J FLUID MECH, 1972, VOL 54, 2

TITLE SECONDARY FLOWS IN DUCTS OF SQUARE CROSS SECTION

DATA NORMALIZED SECONDARY FLOW PROFILES, AXIAL VELOCITY PROFILES

KEY WORDS SECONDARY FLOW, DUCTS

CHANNEL TYPE EXP, DUCT, SMOOTH, ROUGH

FL 23 FT	FW 4 IN	FD 4 IN
CL 23 FT	CW 4 IN	CD 4 IN
FCS	Q AIR	INST HOT WIRE PROBE, PRESSURE TAPPINGS

AUTHOR LAUNDER B E

PUB`N ACADEMIC PRESS, 1975

TITLE STUDIES IN CONVECTION:THEORY ,MEASUREMENT & APPLICATIONS, VOL 1

DATA

KEY WORDS BOUNDARY LAYER, LASER DOPPLER ANEMOMETER, TURBULENCE

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR LEE H L, MAYS L W

PUB`N PASCE, J HYD D, VOL 112, NO 10, OCTOBER, 1986

TITLE HYDRAULIC UNCERTAINTIES IN FLOOD LEVEE CAPACITY

DATA DISCHARGE RATIO, FRICTION SLOPE, HYDRAULIC UNCERTAINTY

KEY WORDS FLOOD DISCHARGE, LEVEE CAPACITY, HYDRAULIC UNCERTAINTY

CHANNEL TYPE THRY, PROTO, SIMP, RGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR LEUTHEUSSER H J
PUB`N PASCE, J HYD D, VOL 89, HY3, MAY, 1963
TITLE TURBULENT FLOW IN RECTANGULAR DUCTS

DATA VELOCITY DISTRIBUTION, ASPECT RATIO, STATIC PRESSURE, SHEAR STRESS, FRICTION COEFFICIENT
KEY WORDS TURBULENT FLOW, RECTANGULAR DUCTS

CHANNEL TYPE EXP, DUCT, SMOOTH

FL 72 FT	FW 3, 9IN	FD 3IN
CL 52 FT	CW 3, 9 IN	CD 3 IN
FCS	Q AIR	INST PRESTON TUBE, PITOT TUBE, MICRO MANOMETER

AUTHOR LI R M, SHEN H W
PUB`N PASCE, J HYD D, VOL 99, HY5, MAY, 1973
TITLE EFFECT OF TALL VEGETATIONS ON FLOW AND SEDIMENT

DATA DRAG COEFFICIENT, VELOCITY, ROUGHNESS SPACING, BOUNDARY SHEAR, DISCHARGE, SLOPE
KEY WORDS FLOW RETARDANCE, VEGETATION

CHANNEL TYPE THEORY, EXP, SIMPLE, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR LIGGET J A, CHIU CL, MIAO L S
PUB`N PASCE, J HYD D, VOL 91, HY6, NOVEMBER, 1965
TITLE SECONDARY CURRENTS IN A CORNER

DATA COORDINATES, WALL SHEAR, ISOVELS, VELOCITY, REYNOLDS
KEY WORDS SECONDARY CURRENTS, CORNER

CHANNEL TYPE THEORY, EXP, SIMPLE, SMTH

FL	FW	FD
CL	CW	CD
FCS	Q	INST HOT FILM ANEMOMETER, PRESTON TUBE, MANOMETER

AUTHOR LIN C C
PUB`N OXFORD UNIVERSITY PRESS, 1959
TITLE TURBULENT FLOWS AND HEAT TRANSFER
DATA LAMINAR FLOW, TURBULENCE, STATISTICAL THEORY, HEAT CONDUCTION, HEAT TRANSFER, FRICTION
KEY WORDS TURBULENT FLOW
CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR LIU H K, HWANG S Y
PUB`N PASCE, J HYD D, VOL 85, HY11, NOVEMBER, 1959
TITLE DISCHARGE FORMULA FOR STRAIGHT ALLUVIAL CHANNELS
DATA REYNOLDS, SLOPE, DISCHARGE, FROUDE, HYDRAULIC RADIUS, SHEAR, BED MATERIAL
KEY WORDS DISCHARGE FORMULA, STRAIGHT ALLUVIAL CHANNELS
CHANNEL TYPE THEORY, SIMPLE, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR O` LOUGHLIN E M, ANNAMBHOTLA V S S
PUB`N J HYD RESEARCH, 7, 2, 1969
TITLE FLOW PHENOMENA NEAR ROUGH BOUNDARIES
DATA VELOCITY, SHEAR VELOCITY, ROUGHNESS CONCENTRATION, DEPTH ROUGHNESS SIZE RATIO
KEY WORDS FLOW PENOMENA, VELOCITY DISTRIBUTION, ROUGH BOUNDARY
CHANNEL TYPE EXP, SIMPLE, ROUGH

FL	FW 2 FT	FD
CL	CW 2 FT	CD
FCS	Q	INST

AUTHOR LU S S, WILLMARTH W W

PUB`N J FLUID MECH, 1973, 60, 3

TITLE MEASUREMENTS OF THE STRUCTURE OF THE REYNOLDS STRESS IN A TURBULENT BOUNDARY LAYER

DATA REYNOLDS STRESS, BURST INTERVAL, SWEEP INTERVAL, BURST DURATION, SWEEP DURATION

KEY WORDS REYNOLDS STRESS, STRUCTURE

CHANNEL TYPE EXP, SMTH, SIMP, DUCT

FL
FW 5 FT
FD 7 FT

CL
CW 5 FT
CD 7 FT

FCS
Q AIR
INST HOT WIRE ANEMOMETER

AUTHOR LUNDGREN H, JONSSON I G

PUB`N PASCE, J HYD D, VOL 90, HY1, JANUARY, 1964

TITLE SHEAR AND VELOCITY DISTRIBUTION IN SHALLOW CHANNELS

DATA ISOVELS, ORTHOGONALS, SHEAR STRESS DISTRIBUTION, DIFFUSION COEFFICIENT, MOMENTUM TRANSFER

KEY WORDS SHEAR, VELOCITY DISTRIBUTION, SHALLOW CHANNELS

CHANNEL TYPE THEORY, SIMPLE, SMOOTH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR LUNDGREN H, JONSSON I G

PUB`N PASCE, J HYD D, VOL 90, HY5, SEPT, 1964

TITLE SHEAR AND VELOCITY DISTRIBUTION IN SHALLOW CHANNELS

DATA DISCUSSION by LEUTHEUSSER, MACAGNO, HUNG. CLOSURE by LUNDGREN, JONSSON

KEY WORDS SHEAR & VELOCITY DISTRIBUTION, SHALLOW CHANNEL

CHANNEL TYPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR MACAGNO E O

PUB`N J HYDRAULIC RESEARCH, 3, 1965, NO 2

TITLE RESISTANCE TO FLOW IN CHANNELS OF LARGE ASPECT RATIO

DATA ASPECT RATIO, FRICTION FACTOR, SHAPE FUNCTIONS, LAMINAR FLOW, TURBULENT FLOW

KEY WORDS RESISTANCE, ASPECT RATIO

CHANNEL TYPE THEORY, SIMPLE, SMOOTH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR MacMILLAN F A

PUB`N AERONAUTICAL RESEARCH COUNCIL, MIN. OF SUPPLY, 1957

TITLE EXPERIMENTS ON PITOT TUBES IN SHEAR FLOW

DATA VELOCITY, SHEAR VELOCITY, PITOT DIAMETER, WALL CORRECTION, DISTANCE, DISPLACEMENT

KEY WORDS PITOT TUBE, SHEAR FLOW, DISPLACEMENT

CHANNEL TYPE EXP, SMOOTH, PIPE

FL 7.42 FT
FW 1.996 IN DIAM
FD

CL 6 FT
CW 1.996 IN DIAM
CD

FCS
Q AIR, 0.36 - 1.55 CUSECS
INST PITOT TUBE

AUTHOR MAGGIOLO O J, GUARGA R, BORGHI J

PUB`N J HYDRAULIC RESEARCH, 8, 1970, 2

TITLE A NEW METHOD FOR MEASURING SHEAR STRESSES IN A HYDRAULICALLY ROUGH FLOW

DATA DIFFERENTIAL PRESSURE HEAD, SHEAR STRESS, NIKURADSE ROUGHNESS, DISTANCE

KEY WORDS SHEAR STRESS, MEASUREMENT

CHANNEL TYPE EXP, ROUGH, PIPE

FL 10 M
FW 2.5 IN DIAM
FD

CL 10 M
CW 2.5 IN DIAM
CD

FCS
Q AIR
INST PITOT TUBES, PEIZOMETRIC TAPPINGS

AUTHOR MARCHI E
PUB`N IAHR, 12TH CONGRESS, FORT COLLINS, SEPT, 1967
TITLE RESISTANCE TO FLOW IN FIXED BED CHANNELS, INFLUENCE OF X-SECTIONAL SHAPE & FREE SURFACE
DATA VELOCITY PROFILES, RELATIVE DEPTH, FRICTION FACTOR, SHAPE RADIUS, RESISTANCE DATA
KEY WORDS RESISTANCE, VELOCITY, OPEN CHANNEL
CHANNEL TYPE THRY, EXP, SIMP, RGH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR MATTHEW G D
PUB`N PICE, 2, 1986, 81, JUNE, 9028
TITLE VELOCITY PROFILES AND FRICTION FACTOR RELATIONSHIPS FOR TURBULENT FLOW IN SMOOTH PIPES
DATA VELOCITY DISTRIBUTION
KEY WORDS VELOCITY PROFILES, FRICTION FACTOR, TURBULENT, PIPE
CHANNEL TYPE THRY, EXP, PIPE, SMTH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR McKEOGH E J, FRASER S M, ERVINE D A
PUB`N IAHR, 1983, MOSCOW, VOL 3, SEPT, PROC 20 TH CONG
TITLE VELOCITY AND TURBULENCE MEASUREMENTS IN AIR/WATER FLOWS USING LASER DOPPLER ANEMOMETRY
DATA TURBULENDCE KINETIC ENERGY, VELOCITY VECTOR
KEY WORDS VELOCITY, TURBULENCE, LASER DOPPLER ANEMOMETRY
CHANNEL TYPE EXP, SIMPLE, CYLINDER
FL
FW 0.14 M DIA.
FD 0.20 M
CL
CW 0.14 M DIA
CD 0.20 M
FCS
Q
INST LASER DOPPLER ANEMOMETER

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.................................................................................
.AUTHOR McQUIVEY R S, RICHARDSON E V                     .PUB`N PASCE, J HYD    .
..........................................................D, VOL 95, HY1,       .
.TITLE SOME TURBULENCE MEASUREMENTS IN OPEN CHANNEL FLOW .JANUARY, 1969         .
.                                                        .                      .
.................................................................................
.DATA REYNOLD STRESSES, TURBULENCE INTENSITY,        .KEY WORDS TURBULENCE,     .
.PRESSURE DISTRIBUTIONS, ENERGY SPECTRA              .OPEN CHANNEL FLOW         .
......................................................                          .
.CHANNEL TYPE EXP, SIMPLE, ROUGH, SMOOTH             .                          .
.................................................................................
.FL 10 M                 .FW 0.20 M                .FD 0.20 M                   .
.................................................................................
.CL 10 M                 .CW 0.20 M                .CD 0.20 M                   .
.................................................................................
.FCS 3.3 - 21.1(-2)  .Q 0.044 - 0.073      .INST PITOT TUBE, HOT FILM           .
.                    .CUSECS               .ANEMOMETER                          .
.................................................................................


.................................................................................
.AUTHOR McQUIVEY R S, KEEFER T N                         .PUB`N PASCE, J HYD    .
..........................................................D, VOL 98, HY9,       .
.TITLE MEASUREMENT OF VELOCITY CONCENTRATION COVARIANCE  .SEPT, 1972            .
.                                                        .                      .
.................................................................................
.DATA SPECTRAL DENSITY, FREQUENCY, RELATIVE          .KEY WORDS VELOCITY        .
.CONCENTRATION, DIFFUSION COEFF, VEL CONC COVARIANCE .CONCENTRATION COVARIANCE .
......................................................                          .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                     .                          .
.................................................................................
.FL 140 FT               .FW 3.87 FT               .FD 2 FT                     .
.................................................................................
.CL 140 FT               .CW 3.87 FT               .CD 2 FT                     .
.................................................................................
.FCS 0.12 - 0.47(-3) .Q 3.205 - 3.888      .INST CONDUCTIVITY PROBE, HOT FILM   .
.                    .CUSECS               .ANEMOMETER, PITOT TUBE              .
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.AUTHOR McQUIVEY R S                                     .PUB`N US GEOLOGICAL   .
..........................................................SURVEY PROFESSIONAL   .
.TITLE SUMMARY OF TURBULENCE DATA FROM RIVERS,           .PAPER 802 - B         .
.CONVEYANCE CHANNELS, AND LABORATORY FLUMES              .                      .
.................................................................................
.DATA RELATIVE DEPTH, MEAN VELOCITY, TURBULENCE      .KEY WORDS TURBULENCE      .
.INTENSITY, RELATIVE TURBULENCE INTENSITY            .DATA                      .
......................................................                          .
.CHANNEL TYPE EXP, PROTO, ROUGH                      .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST CURRENT METER, HOT FILM        .
.                    .                     .ANEMOMETER                          .
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AUTHOR McQUIVEY R S

PUB`N US GEOLOGICAL SURVEY PROFESSIONAL PAPER 802 - A

TITLE PRINCIPLES & MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN CHANNEL FLOWS

DATA VOLTAGE, VELOCITY, TURBULENCE INTENSITY, REYNOLDS, RELATIVE DEPTH, ENERGY SPECTRA, TIME

KEY WORDS MEASURING TECHNIQUES, TURBULENCE, OPEN CHANNEL

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST HOT FILM ANEMOMETER

AUTHOR MELLING A, WHITELAW J H

PUB`N J FLUID MECH, 1976, VOL 78, 2

TITLE TURBULENT FLOW IN A RECTANGULAR DUCT

DATA VELOCITY, TURBULENCE INTENSITY, NORMALIZED VEL, REYNOLDS SHEAR STRESS, KINETIC ENERGY

KEY WORDS TURBULENT FLOW, RECTANGULAR DUCT

CHANNEL TYPE EXP, DUCT, SIMPLE, SMOOTH

FL 1.8 M	FW 0.04 M	FD 0.041 M
CL 1.8 M	CW 0.04 M	CD 0.041 M
FCS	Q 1.5 KG/S	INST LASER DOPPLER ANEMOMETER, PRESSURE TAPPINGS, ORIFICE PLATE

AUTHOR MEYER J

PUB`N BERLIN TECHNICAL UNIVERSITY, REPORT 74, 1971

TITLE WALL SHEAR STRESS AND VELOCITY DISTRIBUTION IN SMOOTH TRIANGULAR CHANNELS (GERMAN)

DATA FRICTION FACTOR, REYNOLDS, ASPECT RATIO, ISOVELS, SHEAR STRESS

KEY WORDS SHEAR STRESS, VELOCITY, SMOOTH TRIANGULAR CHANNEL

CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 15 M	FW 1 M	FD 0.5 M
CL 15 M	CW 1 M	CD 0.5 M
FCS	Q	INST POINT GAUGES, PRESTON TUBE, TRANSDUCER, PITOT TUBE

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.................................................................................
.AUTHOR MILLER A C, RICHARDSON E V                       .PUB`N PASCE, J HYD    .
.........................................................D, VOL 100, HY1,       .
.TITLE DIFFUSION AND DISPERSION IN OPEN CHANNEL FLOW     .JANUARY, 1974         .
.                                                        .                      .
.................................................................................
.DATA RELATIVE VELOCITY, REL. ROUGHNESS, ISOVELS,    .KEY WORDS DIFFUSION,      .
.DISPERSION COEFFICIENTS                             .DISPERSION, OPEN CHANNEL .
......................................................                          .
.CHANNEL TYPE EXP, SIMPLE, ROUGH                     .                          .
.................................................................................
.FL 60 FT                .FW 2 FT                  .FD                          .
.................................................................................
.CL 60 FT                .CW 2 FT                  .CD                          .
.................................................................................
.FCS 10.4 - 296(-4)  .Q 0.815 - 2.14       .INST FLUOROMETER, HOT WIRE          .
.                    .CUSECS               .ANEMOMETER                          .
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.AUTHOR MISSOURI UNIVERSUTY; EDITORS - ZAKIN J L, PATTERS.PUB`N SCIENCE PRESS, .
.........................................................PRINCETON, 1977        .
.TITLE TURBULENCE IN LIQUIDS, PROCEEDINGS 4 TH SYMPOSIUM .                      .
.ON TURBULENCE IN LIQUIDS, 1975                          .                      .
.................................................................................
.DATA                                                .KEY WORDS TURBULENCE,     .
.                                                    .FLUID STRUCTURE           .
.....................................................INTERACTION               .
.CHANNEL TYPE                                        .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST                                .
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.AUTHOR MORRIS H M                                       .PUB`N PASCE, VOL 85, .
.........................................................HY7, JULY, 1959        .
.TITLE DESIGN METHODS FOR FLOW IN ROUGH CONDUITS         .                      .
.                                                        .                      .
.................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO, BOUNDARY LAYER   .KEY WORDS TURBULENT       .
.THICKNESS                                           .FLOW, ROUGH CONDUITS,     .
.....................................................DESIGN METHOD             .
.CHANNEL TYPE THRY, EXP, RGH, PIPE, SIMP             .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST                                .
.                    .                     .                                    .
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AUTHOR MORRIS H M

PUB`N TASCE, VOL 120, 1955

TITLE FLOW IN ROUGH CONDUITS (INC DISCUSSIONS)

DATA ROUGHNESS RATIO, FLOW/SHEAR VELOCITY RATIO, RESISTANCE FUNC., REYNOLDS NO

KEY WORDS ROUGHNESS SPACING, CONDUITS

CHANNEL TYPE THRY, EXP, RGH, PIPE

FL 193 FT	FW 24, 36 IN DIAM.	FD
CL 193 FT	CW 24, 36 IN DIAM.	CD
FCS	Q	INST

AUTHOR MULLER A, STUDERUS X

PUB`N IAHR, 1979, CAGLIARI, ITALY, PROC 18 TH CONGRESS

TITLE SECONDARY FLOW IN AN OPEN CHANNEL

DATA NORMALIZED VELOCITY, NORMALIZED REYNOLDS STRESS

KEY WORDS SECONDARY FLOW, OPEN CHANNEL

CHANNEL TYPE EXP, SIMPLE, ROUGH

FL 25 M	FW 0.6 M	FD
CL 25 M	CW 0.6 M	CD
FCS 1.52(-3)	Q	INST LASER DOPPLER ANEMOMETRY, HOT FILM ANEMOMETRY

AUTHOR MYERS W R C

PUB`N J HYD RESEARCH, 16, NO 2, 1978

TITLE MOMENTUM TRANSFER IN A COMPOUND CHANNEL

DATA APPARENT SHEAR FORCE, APP SHEAR STRESS, REYNOLDS, DIMENSIONLESS DEPTH, WIDTH RATIOS

KEY WORDS MOMENTUM TRANSFER, SHEAR STRESS, COMPOUND CHANNEL

CHANNEL TYPE EXP, COMPOUND, SMOOTH

FL 9.15 M	FW 0.61 M	FD 0.178 M
CL 9.15 M	CW 0.254 M	CD 0.102 M
FCS 2.645(-4)	Q 6.3 - 18.2 L/S	INST PRESTON TUBE, POINT GAUGE, WEIR, MANOMETER

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.AUTHOR MYERS W R C, ELSAWY E M                          .PUB`N PASCE, J HYD   .
..........................................................D, VOL 101, HY7,     .
.TITLE BOUNDARY SHEAR IN CHANNEL WITH FLOOD PLAIN        .JULY, 1975           .
.                                                        .                     .
................................................................................
.DATA FLOOD PLAIN SHEAR DISTRIBUTION, WALL SHEAR,    .KEY WORDS BOUNDARY       .
.DEPTH                                               .SHEAR, FLOOD PLAIN       .
......................................................                         .
.CHANNEL TYPE EXP, SIMPLE, COMP, SMOOTH              .                         .
................................................................................
.FL 11 M                 .FW 0.61 M                .FD 0.178 M                 .
................................................................................
.CL 11 M                 .CW 0.254 M               .CD 0.102 M                 .
................................................................................
.FCS 2.65(-4)        .Q 0.225 - 0.65       .INST PRESTON TUBE, MANOMETER,      .
.                    .CUSECS               .POINT GAUGE, ADJ WEIR              .
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.AUTHOR MYERS W R C                                      .PUB`N PASCE, J HYD   .
..........................................................D, VOL 108, HY4,     .
.TITLE FLOW RESISTANCE IN WIDE RECTANGULAR CHANNELS      .APRIL, 1982          .
.                                                        .                     .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS, ASPECT RATIO        .KEY WORDS FRICTION       .
.                                                    .COEFF, RECT CHANNEL,     .
......................................................ASPECT RATIO             .
.CHANNEL TYPE EXP, SIMPLE, COMP, SMOOTH              .                         .
................................................................................
.FL 8 M                  .FW 0.755 M               .FD 0.254 M                 .
................................................................................
.CL 8 M                  .CW 0.202, 0.755 M        .CD 0.254 M                 .
................................................................................
.FCS 4 - 17.3(-4)    .Q 0.016 - 1.12       .INST VOLUMETRIC, VENTURI, POINT    .
.                    .CUSECS               .GAUGE, ADJ WEIR                    .
................................................................................


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.AUTHOR MYERS W R C                                      .PUB`N SEE MYERS,     .
..........................................................MARCH 1985, UNIV OF  .
.TITLE FRICTIONAL RESISTANCE IN CHANNELS WITH            .ULSTER, CIV ENG DEPT .
.FLOODPLAINS                                             .                     .
................................................................................
.DATA REYNOLDS NO RATIO, RELATIVE DEPTH, REYNOLDS    .KEY WORDS FRICTIONAL     .
.NO, FRICTION FACTOR                                 .RESISTANCE, OPEN         .
......................................................CHANNEL, FLOODPLAIN      .
.CHANNEL TYPE EXP, COMP, SMOOTH                      .                         .
................................................................................
.FL 8 M                  .FW 0.52 M, 0.76 M        .FD 0.254 M                 .
................................................................................
.CL 8 M                  .CW 0.16 M                .CD 0.08, 0.12 M            .
................................................................................
.FCS 2.2 - 22.8(-4)  .Q 3.74 - 34.5 L/S    .INST VENTURI, MANOMETER, POINT     .
.                    .                     .GAUGE, ADJ WEIR, MIN CURRENT METER .
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.AUTHOR MYERS W R C                                      .PUB`N UNIVERSITY OF  .
..........................................................ULSTER, DEPT. CIV.   .
.TITLE FLOW RESISTANCE IN SMOOTH COMPOUND CHANNELS       .ENG., MARCH, 1985    .
.EXPERIMENTAL DATA                                       .                     .
................................................................................
.DATA POINT VELOCITIES, DEPTH, DISCHARGE, HYD        .KEY WORDS FLOW           .
.RADIUS, AVE VELOCITY, REYNOLDS, FRICTION FACTOR     .RESISTANCE, SMOOTH       .
......................................................COMPOUND CHANNEL, DATA   .
.CHANNEL TYPE EXP, COMP, SMOOTH                      .                         .
................................................................................
.FL 8 M                  .FW 0.52, 0.76 M          .FD 0.254 M                 .
................................................................................
.CL 8 M                  .CW 0.16 M                .CD 0.08, 0.12 M            .
................................................................................
.FCS 2.2 - 22.8(-4)  .Q 3.16 - 34.5 L/S    .INST MINIATURE CURRENT METER,      .
.                    .                     .POINT GAUGE                        .
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.AUTHOR NAKAGAWA H, NEZU I, TOMINAGA A                   .PUB`N J HYDROSCIENCE .
..........................................................& HYDR. ENG., VOL 1, .
.TITLE TURBULENT STRUCTURE WITH LONGITUDINAL SECONDARY   .NO 1, APR, 1983      .
.FLOW                                                    .                     .
................................................................................
.DATA PRIMARY MEAN VEL, SECONDARY FLOW VEL VECTORS,  .KEY WORDS TURBULENCE,    .
.TURBULENCE INTENSITY, REYNOLDS STRESS               .SECONDARY FLOW           .
......................................................                         .
.CHANNEL TYPE EXP, SMOOTH, ROUGH, DUCT               .                         .
................................................................................
.FL 6 M                  .FW 0.18 M                .FD 0.08 M                  .
................................................................................
.CL 6 M                  .CW 0.18 M                .CD 0.08 M                  .
................................................................................
.FCS                 .Q AIR                .INST HOT WIRE ANEMOMETER           .
.                    .                     .                                   .
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.AUTHOR NAKAGAWA H, NEZU I, UEDA H                       .PUB`N PROC JSCE,     .
..........................................................241, SEPT, 1975      .
.TITLE TURBULENCE OF OPEN CHANNEL FLOW OVER SMOOTH AND   .                     .
.ROUGH BEDS                                              .                     .
................................................................................
.DATA TURB. INTENSITY, REYNOLDS SHEAR STRESS, TURB.  .KEY WORDS TURBULENCE,    .
.ENERGY BUDGET, EDDY SCALE, VEL DISTRIBUTION         .SHEAR STRESS,            .
......................................................                         .
.CHANNEL TYPE EXP, SIMP, SMTH, RGH                   .                         .
................................................................................
.FL 15 M                 .FW 0.5 M                 .FD                         .
................................................................................
.CL 15 M                 .CW 0.5 M                 .CD                         .
................................................................................
.FCS 0.8 - 2.77(-4)  .Q 5.21 - 6.14 L/S    .INST HOT FILM ANEMOMETER, PITOT    .
.                    .                     .TUBE                               .
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AUTHOR NAKAYAMA A, CHOW W L, SHARMA D
PUB`N J FLUID MECH, 1983, VOL 128
TITLE CALCULATION OF FULLY DEVELOPED TURBULENT FLOWS IN DUCTS OF ARBITRARY CROSS SECTION
DATA ISOVELS, SECONDARY FLOW, KINETIC ENERGY, SHEAR STRESS, WALL SHEAR, FRICTION FACTOR
KEY WORDS TURBULENT FLOWS, DUCTS
CHANNEL TYPE THRY, EXP, SIMPLE, SMOOTH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR NALLURI C, ADEPOJU B A
PUB`N J HYDRAULIC RESEARCH, 23, 1985, 1
TITLE SHAPE EFFECTS ON RESISTANCE TO FLOW IN SMOOTH CHANNELS OF CIRCULAR CROSS SECTION
DATA FRICTION FACTOR, REYNOLDS NO, SHAPE FACTOR, DEPTH, REYNOLDS SHEAR, WETTED PERIMETER
KEY WORDS SHAPE EFFECTS, RESISTANCE, SMOOTH CIRCULAR CHANNEL
CHANNEL TYPE EXP, SIMP, SMTH
FL 15 M
FW 0.305 M DIAM
FD
CL 15 M
CW 0.305 M DIAM
CD
FCS 9.9 - 360(-5)
Q
INST POINT GAUGE

AUTHOR NALLURI C, NOVAK P
PUB`N IAHR, 16 TH CONGRESS, SAO PAULO, AUGUST, 1975
TITLE TURBULENCE CHARACTERISTICS IN SMOOTH BED CHANNELS
DATA TURBULENT INTENSITIES, RELATIVE DEPTH, DEPTH/SUB LAYER RATIO
KEY WORDS TURBULENCE, SMOOTH CHANNEL, ENERGY SPECTRA
CHANNEL TYPE EXP, SIMP, SMTH
FL
FW 0.305, 0.152 M DIAM, 0.
FD
CL
CW 0.305, 0.152 M
CD
FCS
Q
INST HOT WIRE ANEMOMETER

AUTHOR NALLURI C, NOVAK P

PUB`N J HYDRAULIC RESEARCH, 11, 1973, 4

TITLE TURBULENCE CHARACTERISTICS IN A SMOOTH OPEN CHANNEL OF CIRCULAR CROSS SECTION

DATA VEL. DISTRIBUTION, ISOVELS, TURBULENT INTENSITY, RELATIVE TURBULENCE, ENERGY SPECTRA

KEY WORDS TURBULENCE, SHEAR STRESS

CHANNEL TYPE EXP, SIMP, SMTH

FL 8 M	FW 0.305 M DIAM.	FD
CL 8 M	CW 0.305 M DIAM.	CD
FCS 0.66 - 6.12(-4)	Q	INST HOT FILM ANEMOMETER, MINIATURE CURRENT METERS

AUTHOR NAOT D, RODI W

PUB`N PASCE, J HYD D, VOL 108, HY8, AUGUST, 1982

TITLE CALCULATION OF SECONDARY CURRENTS IN CHANNEL FLOW

DATA EDDY VISCOSITY, SHEAR STRESS, KINETIC ENERGY, DISSIPATION RATE, REYNOLDS STRESS

KEY WORDS CALCULATION, SECONDARY CURRENTS, CHANNEL FLOW

CHANNEL TYPE THERY, SIMPLE, DUCT, SMOOTH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR NECE R E, GIVLER C A, DRINKER P A

PUB`N MASSACHUSETTS INSTITUTE OF TECH., 6, AUGUST, 1959

TITLE MEASUREMENT OF BOUNDARY SHEAR STRESS IN AN OPEN CHANNEL CURVE WITH A SURFACE PITOT TUBE

DATA VELOCITY AND BOUNDARY SHEARDISTRIBUTION, WATER SURFACE PROFILES, SHEAR STRESS CONTOURS

KEY WORDS BOUNDARY SHEAR STRESS, BEND, PITOT TUBE

CHANNEL TYPE EXP, SMTH, SIMP, BEND

FL 35.57 FT	FW 4.67 FT	FD 0.67 FT
CL 35.57 FT	CW 4.67 FT	CD 0.67 FT
FCS 6.25(-4)	Q 0 - 2.5 CUSECS	INST SURFACE PITOT TUBE

AUTHOR NECE R E, SMITH J D

PUB`N PASCE, J WH D, 96, WW2, MAY, 1970

TITLE BOUNDARY SHEAR STRESS IN RIVERS AND ESTUARIES

DATA BOUNDARY SHEAR STRESS, REYNOLDS NO, RELATIVE ROUGHNESS

KEY WORDS REYNOLDS STRESS, BOUNDARY SHEAR, RIVERS, ESTUARIES

CHANNEL TYPE PROTO, SIMP, RGH

FL

FW

FD

CL

CW

CD

FCS

Q

INST PRESTON TUBE, CURRENT METERS

AUTHOR NEZU I, NAKAGAWA H

PUB`N PASCE, J HYD D, VOL 110, HY2, FEBRUARY, 1984

TITLE CELLULAR SECONDARY CURRENTS IN STRAIGHT CONDUIT

DATA ISOVELS, REYNOLDS STRESS, FLOW PATTERNS, MEAN VELOCITIES, VORTICITY

KEY WORDS CELLULAR, SECONDARY CURRENTS, CONDUIT

CHANNEL TYPE EXP, ROUGH, DUCT

FL 6 M

FW 0.18 M

FD 0.08 M

CL 6 M

CW 0.18 M

CD 0.08 M

FCS

Q AIR

INST HOT WIRE ANEMOMETER

AUTHOR NEZU I, RODI W

PUB`N PASCE, J HYD D, VOL 112, HY5, MAY, 1986

TITLE OPEN CHANNEL FLOW MEASUREMENTS WITH A LASER DOPPLER ANEMOMETER

DATA REYNOLDS STRESS, REL DEPTH, KARMAN k, FROUDE, EDDY VISCOSITY, TURBULENCE INTENSITY

KEY WORDS LASER DOPPLER ANEMOMETER, OPEN CHANNEL FLOW

CHANNEL TYPE EXP, THRY, SIMP, SMTH

FL 20 M

FW 0.60 M

FD 0.65 M

CL 20 M

CW 0.60 M

CD 0.65 M

FCS 1 - 40.9(-4)

Q 4.6 - 74.4 L/S

INST LASER DOPPLER ANEMOMETER (2 COMPONENT)

AUTHOR NICOLLET G, UAN M
PUB`N LA HOUILLE BLANCHE, 1, 1979
TITLE CONTINUOUS FREE SURFACE FLOW OVER COMPOSITE BEDS (IN FRENCH)
DATA ISOVELS, STRICKLER COEFF, DISCHARGE RATIO, ROUGHNESS RATIO
KEY WORDS FLOW INTERACTION, COMP. CHANNEL, COMPOSITE ROUGHNESS
CHANNEL TYPE EXP, PRO, SIM, COMP, RGH, SMT
FL
FW 50, 206 M
FD
CL
CW 50 M
CD 8, 14 M
FCS 5 - 10(-4)
Q 1.235 - 9.17 CUMECS
INST

AUTHOR NNAJI S, WU I
PUB`N PASCE, J ID D, 99, IR1, MARCH, 1973
TITLE FLOW RESISTANCE FROM CYLINDRICAL ROUGHNESS
DATA RESISTANCE PARAMETER, ROUGHNESS SIZE & CONC, VELOCITY, RELATIVE DEPTH
KEY WORDS FLOW RESISTANCE, CYLINDRICAL ROUGHNESS
CHANNEL TYPE THRY, EXP, SIMP, SMTH, RGH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR NOUTSOPOULOS G C, CHRISTODOULOU G C
PUB`N PASCE, J HYD D, VOL 111, HY5, MAY, 1985
TITLE FLOOD PLAIN AND MAIN CHANNEL FLOW INTERACTION (DISCUSSION)
DATA
KEY WORDS FLOODPLAIN, MAIN CHANNEL, FLOW INTERACTION
CHANNEL TYPE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR NOUTSOPOULOS G, HADJIPANOS P

PUB`N IAHR, 1983, MOSCOW, PROC 20 TH CONGRESS

TITLE DISCHARGE COMPUTATIONS IN COMPOUND CHANNELS

DATA DISCHARGE RATIO, DEPTH RATIO, BOUNDARY SHEAR, APPARENT SHEAR

KEY WORDS DISCHARGE COMPUTATION, COMPOUND CHANNELS

CHANNEL TYPE EXP, COMP, ROUGH, SMOOTH

FL 10.75, 15 M	FW 1.0, 1.21 M	FD
CL 10.75, 15 M	CW 0.15, 0.29 M	CD 0.075, 0.12 M
FCS	Q 9 - 30 L/S	INST PRESTON TUBE, DALL TUBE, POINT GAUGE, ORIFICE METER

AUTHOR ODGAARD A J

PUB`N PASCE, J HYD D, VOL 110, HY7, JULY, 1984

TITLE SHEAR INDUCED SECONDARY CURRENTS IN CHANNEL FLOWS

DATA DEPTH, REYNOLDS STRESS, DIMENSIONLESS VELOCITY, TRANSVERSE VELOCITY COMPONENT

KEY WORDS SHEAR, SECONDARY CURRENTS

CHANNEL TYPE THRY, EXP, SIMPLE, ROUGH

FL 25 M	FW 0.6 M	FD
CL 25 M	CW 0.6 M	CD
FCS 1.52(-3)	Q	INST LASER DOPPLER ANEMOMETRY, HOT FILM ANEMOMETRY

AUTHOR OKOYE J K

PUB`N CALIFORNIA INSTITUTE TECHNOLOGY, KH R 23

TITLE CHARACTERISTICS OF TRANSVERSE MIXING IN OPEN CHANNEL FLOWS

DATA CONCENTRATION, TRANSVERSE DISTRIBUTION, CONC DIST VARIANCE,INTERMITTENCY FACTOR

KEY WORDS TRANSVERSE MIXING, OPEN CHANNEL

CHANNEL TYPE EXP, SIMPLE, ROUGH, SMOOTH

FL 18.3, 40 M	FW 0.85, 1.10 M	FD 0.305, 0.61 M
CL 18.3, 40 M	CW 0.85, 1.1 M	CD 0.305, 0.61 M
FCS 0.126 - 3.11(-3)	Q	INST CONDUCTIVITY PROBE, PITOT TUBE, TRANSDUCER, CAMERA

.AUTHOR OLESEN K W
.PUB`N DELFT UNIVERSITY OF TECHNOLOGY, REPORT 85 - 1
.TITLE A MATHEMATICAL MODEL OF THE FLOW AND BEND TOPOGRAPHY IN CURVED CHANNELS
.DATA
.KEY WORDS MATHEMATICAL MODEL, FLOW, CURVED CHANNEL
.CHANNEL TYPE THY, EXP, PRO, RGH, BD, SIM
.FL .FW .FD
.CL .CW .CD
.FCS .Q .INST

.AUTHOR OWEN W M
.PUB`N TASCE, VOL 119, 1954(INC DISCUSSIONS)
.TITLE LAMINAR TO TURBULENT FLOW IN A WIDE OPEN CHANNEL
.DATA FRICTION FACTOR, REYNOLDS NO, VELOCITY DISTRIBUTION, VEL PROFILE,
.KEY WORDS LAMINAR, TURBULENT, OPEN CHANNEL, FRICTION FACTOR
.CHANNEL TYPE EXP, SIMP, SMTH
.FL 20 FT .FW 1.5 FT .FD
.CL 20 FT .CW 1.5 FT .CD
.FCS .Q .INST POINT GAUGES

.AUTHOR PACHECO - CEBALLOS R
.PUB`N PASCE, J HYD ENG, VOL 109, 6, JUNE, 1983
.TITLE ENERGY LOSSES AND SHEAR STRESSES IN CHANNEL BENDS
.DATA DEPTH, VELOCITY, SHEAR, FRICTION COEFF
.KEY WORDS BEND, ENERGY LOSS, SHEAR STRESS
.CHANNEL TYPE THRY, EXP, SIMP, BEND, SMTH
.FL .FW 0.3, 0.61 M .FD 0.043, 0.299 M
.CL .CW .CD 0.507, 5.98 M
.FCS 5 - 40(-4) .Q 0.0054 - 0.07 CUMECS .INST

AUTHOR PARKER G

PUB`N PASCE, J HYD D, VOL 105, HY9, SEPTEMBER, 1979

TITLE HYDRAULIC GEOMETRY OF ACTIVE GRAVEL RIVERS

DATA FORCE VECTORS, SHEAR STRESS, EMPIRICAL WIDTH, DEPTH, SLOPE, DISCHARGE RELATIONSHIPS

KEY WORDS GRAVEL RIVERS, GEOMETRY, EMPIRICISM

CHANNEL TYPE PROTO, THRY, SIMP, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR PARKER G

PUB`N PASCE, J HYD D, VOL 107, HY4, APRIL, 1981

TITLE HYDRAULIC GEOMETRY OF ACTIVE GRAVEL RIVERS (CLOSURE)

DATA SECONDARY VORTICES, BANK GEOMETRY

KEY WORDS SECONDARY FLOW, GRAVEL RIVERS, EMPIRICISM

CHANNEL TYPE PROTO, EXP, THRY, SIMP, RGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR PARSONS D A

PUB`N PASCE, J HYD D, VOL 86, HY4, APRIL, 1960

TITLE EFFECTS OF FLOOD FLOW ON CHANNEL BOUNDARIES

DATA

KEY WORDS FLOOD FLOW, CHANNEL BOUNDARY

CHANNEL TYPE PROTO, SIMPLE, ROUGH

FL
FW
FD

CL
CW 65, 120 FT
CD

FCS 2.5 - 6(-3)
Q 2500 - 8000 CUSECS
INST

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................................................................................
.AUTHOR PASCHE E, EVERS P, ROUVE G                       .PUB`N IAHR, MOSCOW,  .
..........................................................1983, 20 TH CONGRESS .
.TITLE INV ON HYDRAULIC EFFECTS OF VEGETATED FLOODPLAINS .                     .
.IN COMP X SECT AND INFLUENCE ON Q CAP                   .                     .
................................................................................
.DATA STROUHAL NO, REYNOLDS NO, VELOCITY             .KEY WORDS COMPOUND       .
.DISTRIBUTION, RESISTANCE COEFFICIENT                .CHANNEL, VEGETATED       .
......................................................FLOODPLAIN               .
.CHANNEL TYPE EXP, COMPOUND, ROUGH                   .                         .
................................................................................
.FL 25.5 M               .FW 1 M                   .FD                         .
................................................................................
.CL 25.5 M               .CW 0.124, 0.314 M        .CD 0.124 M                 .
................................................................................
.FCS 5 - 10(-4)      .Q                    .INST LASER DOPPLER ANEMOMETER,     .
.                    .                     .HYDROGEN BUBBLE GENERATION, CAMERA .
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.AUTHOR PASCHE E, ROUVE M                                .PUB`N PASCE, J HYD   .
..........................................................D, VOL 111, 9,       .
.TITLE OVERBANK FLOW WITH VEGETATIVELY ROUGHENED         .SEPTEMBER, 1985      .
.FLOODPLAINS                                             .                     .
................................................................................
.DATA TURBULENCE INTENSITY, VEL DISTRIBUTION,APPARENT.KEY WORDS OVERBANK FLOW, .
. SHEAR STRESS, FRICTION FACTOR, SLIP VEL            .VEGETATION, ROUGHENED    .
......................................................FLOODPLAIN               .
.CHANNEL TYPE EXP, PROTO, COMP, ROUGH                .                         .
................................................................................
.FL 25.5 M               .FW 1 M                   .FD 1 M                     .
................................................................................
.CL 25.5 M               .CW 0.124, 0.314 M        .CD 0.124 M                 .
................................................................................
.FCS                 .Q                    .INST PRESSURE TAPPINGS, LASER DOPPL.
.                    .                     .ER VELOCIMETER, PRESTON TUBE, CAMER.
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.AUTHOR PATEL V C                                        .PUB`N J FLUID        .
.........................................................MECHANICS,VOL 23, 1, .
.TITLE CALIBRATION OF THE PRESTON TUBE AND LIMITATIONS   .1965                 .
.ON ITS USE IN PRESSURE GRADIENTS                        .                     .
................................................................................
.DATA PRES TUBE EXT DIAM, FLUID DENS, KINEM VISC,    .KEY WORDS PRESTON TUBE,  .
.PITOT STATIC READING, WALL SHEAR STRESS             .PRESSURE GRADIENTS       .
......................................................                         .
.CHANNEL TYPE EXP, SIMP, SMTH, PIPE                  .                         .
................................................................................
.FL 56.667 FT            .FW 0.5, 2, 8 IN DIAM     .FD                         .
................................................................................
.CL 6.167 FT             .CW 0.5, 2, 8 IN DIA      .CD                         .
................................................................................
.FCS                 .Q AIR                .INST PRESTON TUBE, PITOT TUBE,     .
.                    .                     .PIEZOMETRIC TAPPINGS               .
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AUTHOR PATEL V C, HEAD M R

PUB`N J FLUID MECH, 1969, 38, 1

TITLE OBSERVATIONS ON SKIN FRICTION AND VEL PROFILES IN FULLY DEVELOPED PIPE & CHANNEL FLOWS

DATA SKIN FRICTION COEFFICIENTS, REYNOLDS NO, VELOCITY PROFILES, UNIVERSAL CONSTANTS

KEY WORDS PIPES, CHANNELS, SKIN FRICTION

CHANNEL TYPE EXP, SIMP, SMTH, PIPE

FL 72, 148 IN
FW 0.25, 0.5 IN DIAM; 1 F
FD 0.25 IN

CL 16, 24 IN
CW 0.021, 1 FT
CD 0.25 IN

FCS
Q AIR
INST PITOT TUBE

AUTHOR PERKINS H J

PUB`N J FLUID MECH, 1970, VOL 44, 4

TITLE THE FORMATION OF STREAMWISE VORTICITY IN TURBULENT FLOW

DATA REYNOLDS STRESS, STEAMWISE VORTICITY, BOUNDARY LAYER, ISOVELS

KEY WORDS VORTICITY, TURBULENT FLOW

CHANNEL TYPE THRY, EXP, DUCT, SMOOTH

FL 66 IN
FW 12 IN
FD 12 IN

CL 66 IN
CW 12 IN
CD 12 IN

FCS
Q AIR
INST HOT WIRE ANEMOMETER

AUTHOR PERRY A E, SCHOFIELD W H, JOUBERT P N

PUB`N J FLUID MECH, 1969, 37, 2

TITLE ROUGH WALL TURBULENT BOUNDARY LAYERS

DATA FRICTION FACTOR, REYNOLDS, PRESSURE & VEL PROFILE, ROUGHNESS FUNCTION, MOMENTUM THICKNESS

KEY WORDS WALL SHEAR STRESS, PRESSURE GRADIENTS

CHANNEL TYPE EXP, THRY, SIMP, RGH, DUCT

FL
FW
FD

CL
CW
CD

FCS
Q AIR
INST PITOT TUBE, PRESSURE TAPPINGS

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.AUTHOR PETRYK S, GRANT E U                              .PUB`N PASCE, J HYD   .
..........................................................D, VOL 104, HY5,     .
.TITLE CRITICAL FLOW IN RIVERS WITH FLOODPLAINS          .MAY, 1978            .
.                                                        .                     .
................................................................................
.DATA SPECIFIC ENERGY, DEPTH, DISCHARGE, FROUDE      .KEY WORDS CRITICAL FLOW, .
.                                                    .COMPOUND CHANNELS        .
......................................................                         .
.CHANNEL TYPE THRY, PROTO, COMP, ROUGH               .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW 25, 391 M             .CD 1.83 M                  .
................................................................................
.FCS                 .Q 113 - 340 CUMECS   .INST                               .
.                    .                     .                                   .
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.AUTHOR PETRYK S, SHEN H W                               .PUB`N PASCE, J HYD   .
..........................................................D, VOL 97, HY6,      .
.TITLE DIRECT MEASUREMENT OF SHEAR STRESS IN A FLUME     .JUNE, 1971           .
.                                                        .                     .
................................................................................
.DATA DRAG BALANCE SHEAR STRESS, PRESTON TUBE SHEAR  .KEY WORDS DIRECT         .
.STRESS                                              .MEASUREMENT, SHEAR       .
......................................................STRESS, FLUME            .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST FLOATING ELEMENT DRAG         .
.                    .                     .BALANCE, PRESTON TUBE              .
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.AUTHOR PILLAI N N                                       .PUB`N J HYDRAULIC    .
..........................................................RESEARCH, 8, 1970,   .
.TITLE ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN   .NO 4                 .
.CHANNELS                                                .                     .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS, WETTED              .KEY WORDS UNIFORM FLOW,  .
.PERIMETER/HYD RADIUS RATIO, ASPECT RATIO            .SMOOTH ,RECTANGULAR,     .
......................................................OPEN CHANNELS            .
.CHANNEL TYPE THEORY, EXP, SIMPLE, SMOOTH            .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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AUTHOR POSEY C J

PUB`N PASCE, J HYD D, VOL 109, HY11, NOVEMBER, 1983

TITLE DISCHARGE ASSESSMENT IN COMPOUND CHANNEL FLOW (DISCUSSION)

DATA

KEY WORDS DISCHARGE ASSESSMENT, COMPOUND CHANNEL FLOW

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR POSEY C J

PUB`N ASCE, CIVIL ENGINEERING, APRIL, 1967

TITLE COMPUTATION OF DISCHARGE INCLUDING OVERBANK FLOW

DATA DEPTH, COMPUTED DISCHARGE, OBSERVED DISCHARGE, DISCREPANCY

KEY WORDS COMPUTATION, DISCHARGE, OVERBANK FLOW, SHEAR

CHANNEL TYPE EXP, THRY, COMP, ROUGH

FL 135 FT	FW 5 FT	FD
CL 135 FT	CW 1 FT	CD 1 FT
FCS 3(-3)	Q 2.07 - 44.6 CUSECS	INST

AUTHOR POSEY C J, CHIU C L

PUB`N IAHR, 1973, ISTANBUL, PROC 15 TH CONGRESS

TITLE STOCHASTIC NATURE OF SECONDARY CURRENTS IN OPEN CHANNELS

DATA CALCULATED SECONDARY FLOW

KEY WORDS STOCHASTIC, SECONDARY CURRENTS, OPEN CHANNELS

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

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................................................................................
.AUTHOR PRESTON J H                                      .PUB`N JOURNAL ROYAL  .
.........................................................AERONAUTICAL SOC.,    .
.TITLE THE DETERMINATION OF TURBULENT SKIN FRICTION BY   .VOL 58, FEB, 1954    .
.MEANS OF PITOT TUBES                                    .                     .
................................................................................
.DATA OBSERVED HEADS, CALIBRATION CURVES, SKIN     .KEY WORDS TURBULENT SKIN .
.FRICTION COEFF., VELOCITY PROFILES                .FRICTION, PITOT TUBES,   .
....................................................CALIBRATION              .
.CHANNEL TYPE EXP, SMOOTH, PIPE                    .                         .
................................................................................
.FL 17.83, 16 FT         .FW 2, 7.5 IN DIA         .FD                         .
................................................................................
.CL 3, 4.166 FT          .CW 2, 7.5 IN DIA         .CD                         .
................................................................................
.FCS                 .Q WATER, AIR         .INST PITOT TUBE, PRESSURE TAPPINGS .
.                    .                     .                                   .
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.AUTHOR PRINOS P, TOWNSEND R, TAVOULARIS S               .PUB`N PASCE, J HYD   .
.........................................................D, VOL 111, 9,        .
.TITLE STRUCTURE OF TURBULENCE IN COMPOUND CHANNEL FLOWS .SEPTEMBER, 1985      .
.                                                        .                     .
................................................................................
.DATA TURBULENCE INTENSITY, SHEAR STRESS, VELOCITY, .KEY WORDS TURBULENCE,    .
.ISOVELS, APPARENT SHEAR STRESS                    .COMPOUND CHANNEL         .
....................................................                           .
.CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH             .                         .
................................................................................
.FL 12.2 M               .FW 1.372 M               .FD 0.204 M                 .
................................................................................
.CL 12.2 M               .CW 0.508, 0.58 M         .CD 0.030, 0.102 M          .
................................................................................
.FCS 1(-3)           .Q 11.8 - 32.5 L/S    .INST PITOT TUBE, TRANSDUCER,       .
.                    .                     .PRESTON TUBE, HOT FILM ANEMOMETER  .
................................................................................


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.AUTHOR PRINOS P, TOWNSEND R D                           .PUB`N PASCE, J HYD   .
.........................................................D, VOL 111, HY5,      .
.TITLE FLOOD PLAIN AND MAIN CHANNEL FLOW INTERACTION     .MAY, 1985            .
.      ( DISCUSSION )                                    .                     .
................................................................................
.DATA STAGE, DISCHARGE, ASPECT RATIO               .KEY WORDS FLOODPLAIN,    .
.                                                  .MAIN CHANNEL, FLOW       .
....................................................INTERACTION              .
.CHANNEL TYPE                                      .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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AUTHOR PRINOS P, TOWNSEND R D

PUB'N PROC 5TH INT CONF FIN ELEM IN WATER RESOURCES, 1984

TITLE PREDICTION OF MAIN CHANNEL/FLOODPLAIN FLOW INTERACTION WITH FEM (FINITE ELEMENT MODEL)

DATA ISOVELS

KEY WORDS COMPOUND CHANNEL, FLOW INTERACTION, PREDICTION

CHANNEL TYPE EXP, THRY, COMP, SMTH

FL	FW	FD
CL	CW 0.203, 0.58 M	CD 0.03, 0.102 M
FCS 1(-3)	Q	INST MIN CURRENT METER, PITOT TUBE, PRESSURE TRANSDUCER

AUTHOR PRINOS P, TOWNSEND R D

PUB'N 6 TH CANADIAN HYDRO - TECHNICAL CONF, ONTARIO, 1983

TITLE ESTIMATING DISCHARGE IN COMPOUND OPEN CHANNELS

DATA RELATIVE DEPTH, RELATIVE BOUNDARY SHEAR STRESS, ROUGHNESS, APPARENT SHEAR STRESS, DISCHARGE

KEY WORDS COMPOUND CHANNEL, SHEAR STRESS, MOMENTUM TRANSFER

CHANNEL TYPE EXP, THRY, SMTH, RGH, COMP

FL 12.2 M	FW 1.372 M	FD 0.204 M
CL 12.2 M	CW 0.406, 0.508 M	CD 0.102 M
FCS 3(-3)	Q 0.0151 - 0.0328 CUMECS	INST PIEZOMETRIC TAPPINGS, PRESTON TUBE, STATIC TUBE

AUTHOR PRUS - CHACINSKI T M

PUB'N THE DOCK AND HARBOUR AUTHORITY, JULY, 1955

TITLE HELICAL FLOW IN OPEN CHANNEL BENDS

DATA ISOVELS, DEPTH

KEY WORDS HELICAL FLOW, OPEN CHANNEL, BEND

CHANNEL TYPE EXP, SIMPLE, SMOOTH, BEND

FL	FW	FD
CL	CW	CD
FCS	Q	INST POINT GAUGES

AUTHOR PYLE R, NOVAK P
PUB'N J HYDRAULIC RESEARCH, 19, 1981, 2
TITLE COEFFICIENT OF FRICTION IN CONDUITS WITH LARGE ROUGHNESS
DATA FRICTION FACTOR, RELATIVE DEPTH, VELOCITY, DEPTH, TURBULENCE INTENSITY, ROUGHNESS CONC
KEY WORDS FRICTION COEFFICIENT, CONDUITS, LARGE ROUGHNESS
CHANNEL TYPE EXP, SIMP, RGH,
FL 12, 5, 150 M
FW 0.3, 0.3, 1.0 M
FD
CL 12, 5, 150 M
CW 0.3, 0.3, 1 M
CD
FCS
Q -, AIR, -
INST POINT GAUGE

AUTHOR QUINTELA A C
PUB'N PASCE, J HYD D, VOL 108, HY5, MAY, 1982
TITLE MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN CHANNEL (DISCUSSION)
DATA
KEY WORDS SPECIFIC ENERGY, OPEN CHANNEL, COMPOUND
CHANNEL TYPE THRY, EXP, COMP, SMTH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR RAJARATNAM N, AHMADI R M
PUB'N PASCE, J HYD D, VOL 105, HY5, MAY, 1979
TITLE INTERACTION BETWEEN MAIN CHANNEL AND FLOOD PLAIN FLOWS
DATA VELOCITY PROFILES, BED SHEAR PROFILES, DIMENSIONLESS DEPTH RATIO, ASPECT RATIO
KEY WORDS INTERACTION, MAIN CHANNEL, FLOOD PLAIN
CHANNEL TYPE EXP, COMP, SMOOTH , ROUGH
FL 60 FT
FW 4 FT
FD 3 FT
CL 60 FT
CW 0.67 FT
CD 0.25, 0.36 FT
FCS 0.27 - 1.27(-3)
Q 0.18 - 2.0 CUSECS
INST PITOT TUBE, PRESTON TUBE, PRES PROBES, TRANSDUCERS, POINT GAUGES

AUTHOR RAJARATNAM N, AHMADI R

PUB`N J HYD RESEARCH, 19, 1, 1981

TITLE HYDRAULICS OF CHANNELS WITH FLOOD PLAINS

DATA VEL PROFILES, BOUNDARY SHEAR STRESS PROFILES, SIMILARITY VEL PROFILES, SIM SHEAR PROFILES

KEY WORDS INTERACTION, MAIN CHAN, FLOOD PLAIN, BED SHEAR STRESS

CHANNEL TYPE EXP, COMP, SMOOTH

FL 18.29 M
FW 1.22 M
FD 0.914 M

CL 18.29 M
CW 0.711 M
CD 0.0975 M

FCS 0.36 - 0.6(-3)
Q 0.025 - 0.056 CUMECS
INST PITOT TUBE, PRESTON TUBE, TRANSDUCERS, FLOW METER, PRES PROBES

AUTHOR RAJARATNAM N, AHMADI R M

PUB`N PASCE, J HYD D, VOL 106, HY 11, NOVEMBER, 1980

TITLE INTERACTION BETWEEN MAIN CHANNEL AND FLOODPLAIN FLOWS (CLOSURE)

DATA

KEY WORDS INTERACTION, MAIN CHANNEL, FLOODPLAIN FLOWS

CHANNEL TYPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR RAJARATNAM N, MURALIDHAR D

PUB`N LA HOUILLE BLANCHE, NO 6, 1969

TITLE BOUNDARY SHEAR STRESS DISTRIBUTION IN RECTANGULAR OPEN CHANNELS

DATA VELOCITY, SHEAR STRESS, ASPECT RATIO

KEY WORDS BOUNDARY SHEAR STRESS, RECTANGULAR OPEN CHANNEL

CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 32, 120 FT
FW 9 IN, 2.94 FT
FD 8 IN, 2.5 FT

CL 32, 120 FT
CW 0.25, 2.94 FT
CD 8 IN, 2.5 FT

FCS 5.8 - 19.7(-3)
Q 0.143 - 7.16 CUSECS
INST PITOT TUBE, PRESTON TUBE, ORIFICE METER, PIEZOMETERS

AUTHOR RAJARATNAM N

PUB'N CIVIL ENGINEERING AND PUBLIC WORKS REVIEW, NOV 1965

TITLE ON THE PRESTON TUBE WITH A HEMISPHERICAL NOSE

DATA DIFFERENTIAL PRESSURE, PITOT TUBE, PRESTON TUBE

KEY WORDS PRESTON TUBE, HEMISPHERICAL NOSE

CHANNEL TYPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST PRESTON TUBE, PITOT TUBE

AUTHOR RAJARATNAM N, MURALIDHAR D

PUB'N J HYDRAULIC RESEARCH, 8, 1970, NO 1

TITLE THE SCREW DRIVER PROBE

DATA PRESSURE DIFFERENTIAL, YAW ANGLE

KEY WORDS SCREW DRIVER PROBE

CHANNEL TYPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR RAO K N, NARASIMHA R, NARAYANAN M A B

PUB'N J FLUID MECH., VOL 48, PART 2, 1971

TITLE THE BURSTING PHENOMENON IN A TURBULENT BOUNDARY LAYER

DATA BURST RATE, FREQUENCY, REYNOLDS NO, TIME

KEY WORDS TURBULENCE BURSTS

CHANNEL TYPE EXP, SMTH, SIMPLE, DUCT

FL 8 FT
FW 1 FT
FD 1 FT

CL 8 FT
CW 1 FT
CD 1 FT

FCS
Q AIR
INST PIEZOMETERS, PITOT TUBE, HOT WIRE ANEMOMETER, PRESTON TUBE

AUTHOR REHME K

PUB`N J FLUID MECH, 1974, 64, 2

TITLE TURBULENT FLOW IN SMOOTH CONCENTRIC ANNULI WITH SMALL RADIUS RATIO

DATA VEL DISTRIBUTION, PRESSURE DROP COEFF, REYNOLDS NO, SHEAR STRESS, VELOCITY, RADIUS RATIO

KEY WORDS SHEAR STRESS, PRESSURE DROP, ANNULI, TURBULENCE

CHANNEL TYPE EXP, SMTH, ANNULI, THRY

FL 7.5 M
FW 0.09997 M DIAM
FD

CL 7.5 M
CW 0.09997 M DIAM
CD

FCS
Q AIR
INST PITOT TUBE, HOT WIRE ANEMOMETER

AUTHOR REPLOGLE J A, CHOW V T

PUB`N PASCE, J HYD D, VOL 92, HY2, MARCH, 1966

TITLE TRACTIVE FORCE DISTRIBUTION IN OPEN CHANNELS

DATA PERIMETER, DEPTH, TRACTIVE FORCE RATIOS, VELOCITY,ISOVELS

KEY WORDS TRACTIVE FORCE, OPEN CHANNELS

CHANNEL TYPE EXP, THRY, SIMP, SMTH, RGH

FL 20 FT PIPES
FW 4.015, 5.248 IN DIAM
FD

CL 20 FT PIPES
CW 4.02, 5.25 IN D.
CD

FCS 2 - 8(-3)
Q 0.0275 - 0.1758 CUSECS
INST TAPPING POINTS, TOTAL HEAD PROBE, PITOT TUBE, VOLUMETRIC, MANOMET

AUTHOR RICHARDSON E V, McQUIVEY R S

PUB`N PASCE, VOL 94, HY2, MARCH, 1968

TITLE MEASUREMENT OF TURBULENCE IN WATER

DATA HOT WIRE/HOT FILM SENSITIVITY, VELOCITY, TURBULENCE INTENSITY, REYNOLDS NO, FREQ SPECTRUM

KEY WORDS TURBULENCE MEASUREMENT

CHANNEL TYPE EXP, SIMP, SMTH, RGH

FL 10 M
FW 0.20 M
FD

CL 10 M
CW 0.20 M
CD

FCS 0.77 - 8.44(-3)
Q 0.054 - 0.134 CUSECS
INST PEIZOMETRIC TAPPINGS, POINT GAUGE, HOT FILM ANEMOMETER

AUTHOR ROBINSON A R, ALBERTSON M L

PUB'N TRANS AMER GEOPHYSICAL UNION, VOL 33, 6, DEC, 1952

TITLE ARTIFICIAL ROUGHNESS STANDARD FOR OPEN CHANNELS

DATA RESISTANCE COEFFICIENT, RELATIVE ROUGHNESS, REYNOLDS NO.

KEY WORDS ROUGHNESS, OPEN CHANNELS

CHANNEL TYPE EXP, SIMP, ROUGH

FL 20 FT	FW 9.00 IN	FD 10.5 IN
CL 14 FT	CW 9.00 IN	CD 10.5 IN
FCS 1 - 40(-3)	Q	INST POINT GAUGE

AUTHOR ROUSE H

PUB'N PASCE, J HYD D, VOL 91, HY4, JULY, 1965

TITLE CRITICAL ANALYSIS OF OPEN CHANNEL RESISTANCE

DATA FROUDE, REYNOLDS NO, ROUGHNESS CONC AND HEIGHT, RESISTANCE COEFF, EQUIV ROUGHNESS

KEY WORDS OPEN CHANNEL RESISTANCE

CHANNEL TYPE THEORY, EXP, ROUGH, SMOOTH

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR ROZOVSKII I L

PUB'N ACADEMY OF SCIENCES,USSR, KIEV, 1957

TITLE FLOW OF WATER IN BENDS OF OPEN CHANNELS

DATA THEORETICAL INVESTIGATION, LONGITUDINAL & TRANSVERSE VELOCITIES, EXPERIMENTAL DATA

KEY WORDS FLOW, BEND, OPEN CHANNEL

CHANNEL TYPE

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR SAMUELS P G, GRAY M P

PUB`N HYDRAULICS RESEARCH LTD, REPORT EX 999, MARCH, 1982

TITLE THE FLUCOMP RIVER MODEL PACKAGE

DATA DATA REQUIREMENTS, RIVER TOPOGRAPHY SURVEY, BRIDGES ,CONTROL STRUCTURES, FLOW DATA

KEY WORDS FLOOD ROUTING MODEL

CHANNEL TYPE THRY, PROTO, EXP, RGH, COMP

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR SAMUELS P G

PUB`N HYDRAULICS RESEARCH LTD, REPORT IT 273, JULY, 1984

TITLE COMPUTATIONAL MODELLING OF OPEN CHANNEL FLOW - AN ANALYSIS OF SOME PRACTICAL DIFFICULTIES

DATA CONVEYANCE, DEPTH, CROSS SECTION, ENERGY MULTIPLIERS, AREA RATIO

KEY WORDS COMPUTATIONAL MODEL, OPEN CHANNEL FLOW

CHANNEL TYPE THRY, EXP, PRO, RGH, SIM, COM

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR SARGENT R J

PUB`N J.I.W.E.S., 33, 3, 1979

TITLE VARIATION OF MANNINGS n ROUGHNESS COEFFICIENT WITH FLOW IN OPEN RIVER CHANNELS

DATA MANNINGS n

KEY WORDS MANNINGS, OPEN CHANNELS

CHANNEL TYPE PROTO, SIMPLE, ROUGH

FL	FW	FD
CL	CW	CD
FCS	Q 1.219 - 5.059 CUMECS	INST

AUTHOR SARMA K V N, LAKSHMINARAYANA P, LAKSHMANA RAO N S

PUB`N PASCE, J HYD D, VOL 109, 2, FEBRUARY, 1983

TITLE VELOCITY DISTRIBUTION IN SMOOTH RECTANGULAR OPEN CHANNELS

DATA VELOCITY DISTRIBUTION, VEL PROFILES, FROUDE, ASPECT RATIO

KEY WORDS VELOCITY DISTRIBUTION, OPEN CHANNEL

CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 15.25 M	FW 0.61 M	FD 0.30 M
CL 15.25 M	CW 0.305, 0.61 M	CD 0.30 M
FCS	Q 0 - 50 L/S	INST POINT GAUGE, ADJ WEIR, PITOT TUBE, MANOMETER

AUTHOR SARMA K V N, SASIKANTH S R

PUB`N PROC 2ND AUSTRALSIAN CONF HYD & FLUID MECH, 1965

TITLE EVALUATION OF MANNINGS N FOR STEADY NON UNIFORM FLOWS

DATA WATER SURFACE PROFILES

KEY WORDS MANNINGS N, NON UNIFORM STEADY FLOW

CHANNEL TYPE EXP, SIMP, SMTH

FL 49.5 FT	FW 2 FT	FD
CL 15, 17 FT	CW 1 FT	CD
FCS 4.17(-3)	Q 0.2919 - 1.9032 CUSECS	INST POINT GAUGE

AUTHOR SAYRE W W, CHANG F M

PUB`N US GEOLOGICAL SURVEY PROFESSIONAL PAPER 433 E

TITLE LAB INVEST OPEN CHANNEL DISPERSION PROCESSES DISSOLVED SUSPENDED FLOATING DISPERSANTS

DATA FALL VELOCITY, DISPERSION TIME, DISTANCE, DIMENSIONLESS VELOCITY, RELATIVE CONCENTRATION

KEY WORDS OPEN CHANNEL, DISPERSION PROCESS

CHANNEL TYPE SIMPLE, EXP, ROUGH

FL 150 FT	FW 7.83 FT	FD 2 FT
CL 150 FT	CW 7.83 FT	CD 2 FT
FCS	Q	INST FLUOROMETER, MIN CURRENT METER

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................................................................................
.AUTHOR SAYRE W W, ALBERTSON M L                         .PUB`N TASCE, VOL     .
.........................................................128, 1, 1963, PAPER  .
.TITLE ROUGHNESS SPACING IN RIGID OPEN CHANNELS          .3417                 .
.                                                        .                     .
................................................................................
.DATA RESISTANCE FUNCTION, REL ROUGHNESS, ROUGHNESS  .KEY WORDS ROUGHNESS      .
.DENSITY, SPACING PARAMETER,VON KARMAN COEFF         .SPACING, OPEN CHANNELS,  .
.....................................................VON KARMAN                 .
.CHANNEL TYPE EXP, SIMP, ROUGH                       .                         .
................................................................................
.FL 72 FT                .FW 8 FT                  .FD 2 FT                    .
................................................................................
.CL 72 FT                .CW 8 FT                  .CD 2 FT                    .
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.FCS 1 - 3(-3)       .Q 2 - 6 CUSECS       .INST POINT GAUGES, PITOT TUBE      .
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.AUTHOR SCHLICHTING H                                    .PUB`N NACA, TECH     .
.........................................................MEMO NO 1218          .
.TITLE BOUNDARY LAYER THEORY, TURBULENT FLOWS            .                     .
.                                                        .                     .
................................................................................
.DATA PIPE FLOW, FRICTION DRAG, TURBULENT FRICTION   .KEY WORDS TURBULENCE     .
.LAYER, FREE TURBULENCE, PROFILE DRAG                .                         .
......................................................                         .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
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.FCS                 .Q                    .INST                               .
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.AUTHOR SCHOELLHAMER D H, PETERS J C, LAROCK B E         .PUB`N PASCE, J HYD   .
.........................................................D, VOL 111, HY7,      .
.TITLE SUBDIVISION FROUDE NUMBER                         .JULY, 1985           .
.                                                        .                     .
................................................................................
.DATA FLOW, DEPTH, FROUDE, SPECIFIC ENERGY           .KEY WORDS COMPOUND       .
.                                                    .CHANNEL, FROUDE          .
......................................................                         .
.CHANNEL TYPE THRY, PROTO, RGH, COMP                 .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD 1, 13.6 FT              .
................................................................................
.FCS                 .Q 5000 - 50000       .INST                               .
.                    .CUSECS               .                                   .
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.AUTHOR SCHUYF J P                                       .PUB`N J HYDRAULIC    .
.........................................................RESEARCH, 4, 1966, 2  .
.TITLE THE MEASUREMENT OF TURBULENT VELOCITY             .                     .
.FLUCTUATIONS WITH A PROPELLOR TYPE CURRENT METER        .                     .
................................................................................
.DATA ENERGY SPECTRA, STROUHAL NO, TURBULENT KINETIC .KEY WORDS TURBULENCE     .
.ENERGY                                              .MEASUREMENT, MINIATURE   .
.....................................................CURRENT METER             .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST MINIATURE CURRENT METER, HOT  .
.                    .                     .WIRE ANEMOMETER                    .
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.AUTHOR SELLIN R H J                                     .PUB`N LA HOUILLE     .
.........................................................BLANCHE, 7, 1964      .
.TITLE A LAB INVESTIGATION INTO THE INTERACTION OF RIVER .                     .
.CHANNEL AND FLOOD PLAIN FLOWS                           .                     .
................................................................................
.DATA VORTEX PITCH, ISOVELS, VEL, DEPTH, DISCHARGE,  .KEY WORDS INTERACTION,   .
.                                                    .RIVER CHANNEL FLOW,      .
.....................................................FLOOD PLAIN FLOW          .
.CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH               .                         .
................................................................................
.FL 15 FT                .FW 18 IN                 .FD                         .
................................................................................
.CL 15 FT                .CW 4.5 IN                .CD 1.75 IN                 .
................................................................................
.FCS 8.5(-4)         .Q 0.0712 - 0.0875    .INST PRES TAPPINGS, PITOT TUBE,    .
.                    .CUSECS               .CURRENT METER, CAMERA, ADJ WEIR    .
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.AUTHOR SELLIN R H J                                     .PUB`N J HYDRAULIC    .
.........................................................RESEARCH, 8, 1970,    .
.TITLE SOME EXPERIMENTS WITH THE HOT FILM ANEMOMETER IN  .NO 1                 .
.WATER                                                   .                     .
................................................................................
.DATA OUTPUT TURBULENCE, TURB LEVEL, TURB SIGNAL,    .KEY WORDS HOT FILM       .
.ENERGY CONTENT, FREQUENCY, INCIDENCE ANGLE          .ANEMOMETER               .
.....................................................                          .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR SHIH C C, GRIGG N S                              .PUB`N IAHR, 1967,    .
.........................................................VOL 1, PROC 12 TH    .
.TITLE A CONSIDERATION OF THE HYDRAULIC RAD. AS A        .CONG., A 36          .
.GEOMETRIC QUANTITY IN OPEN CHANNEL HYDRAULICS           .                     .
................................................................................
.DATA DEPTH, CHAINAGE, VELOCITY, HYDRAULIC RADIUS,   .KEY WORDS HYDRAULIC      .
.ASPECT RATIO, MANNINGS, REYNOLDS                    .RADIUS, OPEN CHANNEL     .
......................................................                         .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH                    .                         .
................................................................................
.FL 60 FT                .FW 10 IN                 .FD 10 IN                   .
................................................................................
.CL 60 FT                .CW 2.875, 10 IN          .CD 10 IN                   .
................................................................................
.FCS                 .Q                    .INST ADJ. GATE, SLUICE GATE, VOLUME.
.                    .                     .TRIC TANK, ORIFICE, POINT GAUGES   .
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.AUTHOR SHUKRY A                                         .PUB`N PASCE, J HYD   .
.........................................................D, VOL 89, HY3, MAY, .
.TITLE BOUNDARY SHEAR STRESSES IN CURVED TRAPEZOIDAL     .1963                 .
.CHANNELS    (DISCUSSION)                                .                     .
................................................................................
.DATA VELOCITY DISTRIBUTION, SURFACE PROFILE; DEPTH  .KEY WORDS BOUNDARY SHEAR .
.- BREADTH AND ANGLE RATIOS, REYNOLDS NO             .STRESS, CURVED           .
.....................................................TRAPEZOIDAL CHANNELS     .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR SHUKRY A                                         .PUB`N TASCE, VOL     .
.........................................................115, 1950, PAPER     .
.TITLE FLOW AROUND BENDS IN AN OPEN FLUME                .2411                 .
.                                                        .                     .
................................................................................
.DATA VELOCITY COMPONENT DISTRIBUTION, REYNOLDS,     .KEY WORDS FLOW, BENDS,   .
.RADIUS/BREADTH RATIO, SURFACE/BED PROFILES          .OPEN FLUME               .
......................................................                         .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, BEND              .                         .
................................................................................
.FL 9.23, 9.94 M         .FW 0.3 M                 .FD 0.40 M                  .
................................................................................
.CL 9.23, 9.94 M         .CW 0.3 M                 .CD 0.40 M                  .
................................................................................
.FCS                 .Q 70 L/S             .INST PITOT SPHERE                  .
.                    .                     .                                   .
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.AUTHOR SIEBERT W, GOTZ W                                 .PUB`N IAHR, 1975,   .
..........................................................SAO PAULO, VOL 2, 16 .
.TITLE A STUDY ON THE DEFORMATION OF SECONDARY FLOW IN    .TH CONG, PAPER B18  .
.MODELS OF RECTANGULAR MEANDERING CHANNEL                 .                    .
................................................................................
.DATA WIDTH/DEPTH RATIO, VELOCITY, BEND ANGLE/DEPTH   .KEY WORDS SECONDARY     .
.RATIO, VELOCITY PROFILE                              .FLOW, DEFORMATION, RECT .
......................................................MEANDERING CHANNEL       .
.CHANNEL TYPE EXP ,SIMPLE, MEANDER, SMTH              .                        .
................................................................................
.FL 41.7 M                .FW 1 M                   .FD                        .
................................................................................
.CL 41.7 M                .CW 1 M                   .CD                        .
................................................................................
.FCS                  .Q                    .INST HOT FILM ANEMOMETRY          .
.                     .                     .                                  .
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.AUTHOR SIMON A L, BLENCH T, NEILL C R                    .PUB`N PASCE, J HYD  .
..........................................................D, VOL 89, HY4,      .
.TITLE FRICTION FACTORS IN OPEN CHANNELS (DISCUSSION)     .JULY, 1963          .
.                                                         .                    .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO, VELOCITY          .KEY WORDS FRICTION      .
.DEFICIENCY                                           .FACTOR, OPEN CHANNELS   .
.......................................................                        .
.CHANNEL TYPE EXP, PROTO                              .                        .
................................................................................
.FL                       .FW                       .FD                        .
................................................................................
.CL                       .CW                       .CD                        .
................................................................................
.FCS                  .Q                    .INST                              .
.                     .                     .                                  .
................................................................................


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.AUTHOR SMITH C D                                         .PUB`N PASCE, J HYD  .
..........................................................D, VOL 104, HY1,     .
.TITLE EFFECT OF CHANNEL MEANDERS ON FLOOD STAGE IN       .JANUARY, 1978       .
.VALLEY                                                   .                    .
................................................................................
.DATA STAGE, DISCHARGE                                .KEY WORDS MEANDERS,     .
.                                                     .FLOOD STAGE             .
.......................................................                        .
.CHANNEL TYPE EXP, THRY, SIMP, COMP, RGH              .                        .
................................................................................
.FL 80 FT                 .FW 4 FT                  .FD                        .
................................................................................
.CL 80 FT                 .CW 0.4 FT                .CD 0.25 FT                .
................................................................................
.FCS 1(-3)            .Q 0.095 - 1.66       .INST POINT GAUGES                 .
.                     .CUSECS               .                                  .
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.AUTHOR SOLIMAN M M, TINNEY E R                          .PUB`N PASCE, J HYD    .
..........................................................D, VOL 94, HY4,       .
.TITLE FLOW AROUND 180 DEGREE BENDS IN OPEN RECTANGULAR  .JULY, 1968            .
.CHANNELS                                                .                      .
.................................................................................
.DATA ISOVELS, SECONDARY CURRENTS, FROUDE, ASPECT    .KEY WORDS 180 DEGREE      .
.RATIO, HEAD LOSS/VELOCITY HEAD RATIO                .BEND, OPEN RECTANGULAR    .
......................................................CHANNELS                  .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, BEND              .                          .
.................................................................................
.FL 18.25 FT             .FW 12 IN                 .FD 18 IN                    .
.................................................................................
.CL 18.25 FT             .CW 12 IN                 .CD 18 IN                    .
.................................................................................
.FCS                 .Q                    .INST PITOT TUBE, POINT GAUGE, DYE   .
.                    .                     ., MICRO MANOMETER                   .
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.AUTHOR SOOKY A A                                        .PUB`N CIV ENG DEPT,   .
..........................................................PURDUE UNIV,          .
.TITLE THE FLOW THROUGH A MEANDER FLOODPLAIN GEOMETRY    .LAFAYETTE, INDIANA,   .
.                                                        .USA                   .
.................................................................................
.DATA DISCHARGE, DEPTH, SLOPE, ISOVELS, FLOW         .KEY WORDS FLOW, MEANDER,  .
.DISTRIBUTION, RESISTANCE FACTOR, REYNOLDS, FROUDE   .FLOODPLAIN GEOMETRY       .
......................................................                          .
.CHANNEL TYPE EXP, SIMPLE, COMP, SMOOTH              .                          .
.................................................................................
.FL 24 FT                .FW 3.89 FT               .FD 0.5 FT                   .
.................................................................................
.CL 24 FT                .CW 0.687, 3.89 FT        .CD 0.125, 0.5 FT            .
.................................................................................
.FCS 3 - 100(-4)     .Q 25 - 225 GALLONS   .INST PRANDTL TUBE, OSCILLOSCOPE,    .
.                    .PER MIN              .TRANSDUCER, POINT GAUGE             .
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.AUTHOR SOULSBY R L                                      .PUB`N J OF PHYSICAL   .
..........................................................OCEANOGRAPHY, VOL     .
.TITLE SELECTING RECORDING LENGTH AND DIGITIZATION RATE  .10, FEB, 1980         .
.FOR NEAR BED TURBULENCE MEASUREMENTS                    .                      .
.................................................................................
.DATA MEAN VELOCITY, COVARIANCE, ENERGY SPECTRA,     .KEY WORDS TURBULENCE,     .
.SPECTRAL TRANSFER FUNCTION                          .MEASUREMENT CRITERIA      .
......................................................                          .
.CHANNEL TYPE PROTO, ROUGH                           .                          .
.................................................................................
.FL                      .FW                       .FD                          .
.................................................................................
.CL                      .CW                       .CD                          .
.................................................................................
.FCS                 .Q                    .INST                                .
.                    .                     .                                    .
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.AUTHOR STEFFLER P M, RAJARATNAM N, PETERSON A W         .PUB`N PASCE, J HYD   .
.........................................................D, VOL 111, HY1,     .
.TITLE LDA MEASUREMENTS IN OPEN CHANNEL                  .JANUARY, 1983        .
.                                                        .                     .
................................................................................
.DATA BED SHEAR STRESS, MEAN VELOCITY, TURBULENCE,   .KEY WORDS TURBULENCE,    .
.EDDY VISCOSITY, TURBULENT SHEAR STRESS              .SHEAR STRESS, LASER      .
.....................................................DOPPLER ANEMOMETER       .
.CHANNEL TYPE EXP, SIMP, RGH                         .                         .
................................................................................
.FL 35 M                 .FW 1.14 M                .FD 0.5 M                   .
................................................................................
.CL 35 M                 .CW 1.14 M                .CD 0.5 M                   .
................................................................................
.FCS 2.3 - 12(-4)    .Q 0.032 - 0.126      .INST LASER DOPPLER ANEMOMETER      .
.                    .CUMECS               .                                   .
................................................................................


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.AUTHOR STRAUB L G, SILBERMAN E, NELSON H C              .PUB`N TASCE, VOL     .
.........................................................123, 1958             .
.TITLE OPEN CHANNEL FLOW AT SMALL REYNOLDS NUMBERS INC.  .                     .
.DISCUSSION                                              .                     .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS NO, VELOCITY         .KEY WORDS OPEN CHANNEL,  .
.PROFILE, VELOCITY RATIO, ASPECT RATIO               .LAMINAR, TURBULENT,      .
.....................................................REYNOLDS                 .
.CHANNEL TYPE EXP, THRY, SIMP, SMTH, RGH             .                         .
................................................................................
.FL 15, 22 FT            .FW                       .FD                         .
................................................................................
.CL 15, 22 FT            .CW                       .CD                         .
................................................................................
.FCS 1 - 10(-3)      .Q                    .INST PIEZOMETRIC TAPPINGS, PITOT   .
.                    .                     .TUBE                               .
................................................................................


................................................................................
.AUTHOR SUMER B M, DEIGAARD R                            .PUB`N TECHNICAL      .
.........................................................UNIVERSITY OF         .
.TITLE EXP INVESTIGATION OF MOTIONS OF SUSPENDED HEAVY   .DENMARK, 23,         .
.PARTICLES AND THE BURSTING PROCESS                      .NOVEMBER, 1979       .
................................................................................
.DATA VELOCITY PROFILES, PARTICLE DIRECTION          .KEY WORDS TURBULENCE,    .
.HISTOGRAMS, PRESSURE GRADIENT & LIFT FORCE          .OPEN CHANNEL FLOW, LIFT  .
.....................................................FORCES                   .
.CHANNEL TYPE EXP, SIMP, SMTH, RGH                   .                         .
................................................................................
.FL 10 M                 .FW 0.3 M                 .FD 0.3M                    .
................................................................................
.CL 2.5 M                .CW 0.3 M                 .CD 0.3 M                   .
................................................................................
.FCS                 .Q                    .INST MIN FLOWMETER, POINT GAUGES,  .
.                    .                     .ORIFICE PLATE, CAMERA              .
................................................................................
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AUTHOR SUMER B M, MULLER A

PUB'N PROCEEDINGS OF EUROMECH 156, ISTANBUL, 1982

TITLE MECHANICS OF SEDIMENT TRANSPORT

DATA CHAPTER ON FLOW STRUCTURE AS RELATED TO SEDIMENT TRANSPORT

KEY WORDS FLOW STRUCTURE, TURBULENCE

CHANNEL TYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR TAGG A F

PUB'N THE HYDRAULICS OF FLOODS & FLOOD CONTROL, CAMBRIDGE, 1985

TITLE COMPUTATIONAL MODELLING OF THE RIVER STOUR, DORSET UK

DATA WATER LEVEL, DISTANCE, TIME

KEY WORDS COMPUTATIONAL MODEL, CALIBRATION

CHANNEL TYPE PROTO, EXP, THRY, RGH, COMP

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR TAMAI N, IKEUCHI K, YAMAZAKI A, MOHAMED A A

PUB'N J OF HYDROSCIENCE AND HYD. ENG., VOL 1/2, NOV, 1983

TITLE EXPERIMENTAL ANALYSIS ON THE OPEN CHANNEL FLOW IN RECTANGULAR CONTINUOUS BENDS

DATA WATER SURFACE PROFILE, VELOCITY DISTRIBUTION, TRANSVERSE MOMENTUM

KEY WORDS PRIMARY FLOW, SECONDARY CURRENTS, TRANSVERSE MOMENTUM

CHANNEL TYPE EXP, SIMPLE, SMOOTH, BEND

FL 19.41 M

FW 0.30 M

FD

CL 10.607 M

CW 0.30 M

CD

FCS 1(-3)

Q

INST STATIC TUBE, POINT GAUGE, MINIATURE CURRENT METER

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................................................................................
.AUTHOR TAMAI N, IKEYA T                                 .PUB`N J OF           .
.........................................................HYDROSCIENCE AND      .
.TITLE THREE DIMENSIONAL FLOW OVER ALTERNATING POINT     .HYD. ENG., VOL 3/1,  .
.BARS IN A MEANDERING CHANNEL                            .APR, 1985            .
................................................................................
.DATA MEAN VELOCITY, REYNOLDS STRESS, SECONDARY      .KEY WORDS THREE          .
.VELOCITY, ISOVELS, BED SHEAR, EDDY VISCOSITY        .DIMENSIONAL FLOW,        .
.....................................................MEANDERING CHANNEL       .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH                    .                         .
................................................................................
.FL 9.60 M                .FW 0.20 M                 .FD                         .
................................................................................
.CL 1.60 M                .CW 0.20 M                 .CD                         .
................................................................................
.FCS 1(-3)           .Q 0.003 CUMECS        .INST HOT FILM ANEMOMETRY, POINT   .
.                    .                      .GAUGE                             .
................................................................................


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.AUTHOR TAMAI N, HIROSAWA Y                              .PUB`N 5 TH CONG.     .
.........................................................IAHR, ASIAN &         .
.TITLE FIELD OBSERVATION OF TRANSVERSE VARIATION OF      .PACIFIC REG DIV,     .
.SHEAR & DIFFUSIVITY IN TAMA RIVER, TOKYO                .AUG, 1986            .
................................................................................
.DATA ISOVELS, SHEAR VELOCITY, ELECTRIC              .KEY WORDS SHEAR,         .
.CONDUCTIVITY, DEPTH AVERAGED VELOCITY, VEL PROFILE  .DIFFUSIVITY, TRANSVERSE  .
.....................................................VARIATION                .
.CHANNEL TYPE PROTO, SIMP, RGH                       .                         .
................................................................................
.FL                       .FW                        .FD                         .
................................................................................
.CL 200, 300 M            .CW 47 M                   .CD                         .
................................................................................
.FCS                 .Q                     .INST CURRENT METER, ELECTRO -     .
.                    .                      .MAGNETIC CURRENT METER, DYE       .
................................................................................


................................................................................
.AUTHOR TAYLOR R H                                       .PUB`N CALIFORNIA     .
.........................................................INSTITUTE OF          .
.TITLE EXPLORATORY STUDIES OF OPEN CHANNEL FLOW OVER     .TECHNOLOGY, KH-R-4,  .
.BOUNDARIES OF LATERALLY VARYING ROUGHNESS               .1961                 .
................................................................................
.DATA FRICTION FACTOR, REYNOLDS, RELATIVE ROUGHNESS, .KEY WORDS FRICTION       .
.VELOCITY DISTRIBUTION                               .FACTOR, VELOCITY         .
.....................................................DISTRIBUTION             .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH             .                         .
................................................................................
.FL 40 FT                 .FW 10.5 IN                .FD 10 IN                   .
................................................................................
.CL 40 FT                 .CW 10.5 IN                .CD 10 IN                   .
................................................................................
.FCS 0.64 - 32.65(-3).Q                     .INST                              .
.                    .                      .                                  .
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AUTHOR THIJSSE J TH

TITLE FORMULAE FOR THE FRICTION HEAD LOSS ALONG CONDUIT WALLS UNDER TURBULENT FLOW

PUB`N IAHR, 3RD MEETING, GRENOBLE, SEPTEMBER, 1969

DATA

KEY WORDS FRICTION HEAD LOSS, CONDUIT, TURBULENT FLOW

CHANNEL TYPE THRY, EXP, SMTH, RGH, PIPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR TINGSANCHALI T, ACKERMANN M

TITLE EFFECTS OF OVERBANK FLOW IN FLOOD COMPUTATIONS

PUB`N PASCE, J HYD D, VOL 102, HY7, JULY, 1976

DATA MOMENTUM FLUX, MOMENTUM CORRECTION FACTOR

KEY WORDS OVERBANK FLOW, FLOOD COMPUTATIONS, MOMENTUM

CHANNEL TYPE THRY, FIELD, COMP, ROUGH

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR TOEBES G H, SOOKY A A

TITLE HYDRAULICS OF MEANDERING RIVERS WITH FLOOD PLAINS

PUB`N PASCE, J WAT HAR D, VOL 93, WW2, MAY, 1967

DATA DEPTH, DISCHARGE, RESISTANCE FACTOR, ISOVELS, FLOW DISTRIBUTION, FROUDE

KEY WORDS MEANDERING RIVERS, FLOOD PLAINS

CHANNEL TYPE EXP, SIMPLE, COMPOUND, SMTH

FL 24 FT
FW 3.89 FT
FD

CL 24 FT
CW 0.687, 3.89 FT
CD 0.125, 0.5 FT

FCS 3 - 100(-4)
Q 0.21 - 0.45 CUSECS
INST POINT GAUGE, PITOT TUBE, TRANSDUCER

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................................................................................
.AUTHOR TOWNSEND D R                                     .PUB`N PICE, VOL 40,  .
.........................................................7091, JUNE, 1968      .
.TITLE AN INVESTIGATION OF TURBULENCE CHARACTERISTICS IN .                     .
.A RIVER MODEL OF COMPLEX CROSS SECTION                  .                     .
................................................................................
.DATA TURBULENCE INTENSITY, DIFFUSION CONE, TURB INT .KEY WORDS TURBULENCE     .
.RATIO, REYNNOLDS NO RATIO, CONE ANGLE               .CHARACTERISTICS,         .
.....................................................COMPOUND CHANNEL         .
.CHANNEL TYPE EXP, COMPOUND, SMOOTH                  .                         .
................................................................................
.FL 30 FT                 .FW 2 FT                   .FD 7 IN                  .
................................................................................
.CL 30 FT                 .CW 10 IN                  .CD 4 IN                  .
................................................................................
.FCS                 .Q                    .INST HOT FILM ANEMOMETER, DYE,     .
.                    .                     .CAMERA, PITOT TUBE                 .
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................................................................................
.AUTHOR TOWNSEND A                                       .PUB`N CAMBRIDGE      .
.........................................................UNIVERSITY PRESS,     .
.TITLE THE STRUCTURE OF TURBULENT SHEAR FLOW             .1976                 .
.                                                        .                     .
................................................................................
.DATA TURBULENT FLOW, OPEN CHANNELS, BOUNDARY LAYER, .KEY WORDS TURBULENCE     .
.CONVECTION                                          .                         .
.....................................................                          .
.CHANNEL TYPE                                        .                         .
................................................................................
.FL                       .FW                        .FD                       .
................................................................................
.CL                       .CW                        .CD                       .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR TRACY H J                                        .PUB`N PASCE, J HYD   .
.........................................................D, VOL 91, HY6,       .
.TITLE TURBULENT FLOW IN A THREE DIMENSIONAL CHANNEL     .NOVEMBER, 1965       .
.                                                        .                     .
................................................................................
.DATA VELOCITY, CHANNEL COORDINATES, VELOCITY        .KEY WORDS TURBULENT      .
.COMPONENT, SHEAR STRESS, APPARENT SHEAR             .FLOW, THREE DIMENSIONAL  .
.....................................................CHANNEL, SHEAR           .
.CHANNEL TYPE EXP, SIMPLE, CONDUIT, SMTH             .                         .
................................................................................
.FL 29 FT                 .FW 32 IN                  .FD 5 IN                  .
................................................................................
.CL 29 FT                 .CW 32 IN                  .CD 5 IN                  .
................................................................................
.FCS                 .Q AIR                .INST PRESSURE TAPPINGS, HOT FILM   .
.                    .                     .ANEMOMETER, MICROMANOMETER         .
................................................................................
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.AUTHOR TRACY H J                                        .PUB`N GEOLOGICAL   .
.........................................................SURVEY PROFESSIONAL .
.TITLE THE STRUCTURE OF A TURBULENT FLOW IN A CHANNEL OF .PAPER 983          .
.COMPLEX SHAPE                                           .                   .
.........................................................................
.DATA MEAN VELOCITY, VEL COMPONENTS, SHEAR VEL,      .KEY WORDS TURBULENT FLOW .
.SHEAR STRESS, VEL FLUCTUATION, SECONDARY MOTION     .STRUCTURE, COMPOUND     .
.....................................................CHANNEL                 .
.CHANNEL TYPE EXP, COMP, SMOOTH, DUCT                .                        .
.........................................................................
.FL 84 FT                 .FW 20 IN                .FD 12.25 IN               .
.........................................................................
.CL 84 FT                 .CW 12.25 IN             .CD 4 IN                   .
.........................................................................
.FCS               .Q AIR               .INST HOT WIRE ANEMOMETER             .
.                  .                    .                                     .
.........................................................................


.........................................................................
.AUTHOR TRACY H J, LESTER C M                            .PUB`N GEOLOGICAL   .
.........................................................SURVEY WATER SUPPLY .
.TITLE RESISTANCE COEFFICIENTS & VELOCITY DISTRIBUTION,  .PAPER 1592-A       .
.SMOOTH RECTANGULAR CHANNEL                              .                   .
.........................................................................
.DATA WATER SURFACE PROFILE, FRICTION FACTOR,        .KEY WORDS RESISTANCE     .
.REYNOLDS, FROUDE, ASPECT RATIO ,VELOCITY, SHEAR     .COEFF, VEL DISTRIBUTION, .
.....................................................RECT CHANNEL            .
.CHANNEL TYPE EXP, SIMPLE, SMOOTH                    .                        .
.........................................................................
.FL 80 FT                 .FW 3.5 FT               .FD 18 IN                  .
.........................................................................
.CL 80 FT                 .CW 3.5 FT               .CD 18 IN                  .
.........................................................................
.FCS 0.7 - 331(-4)   .Q 0.3 - 7.3 CUSECS   .INST POINT GAUGES, PIEZOMETRIC    .
.                    .                     .TAPPINGS, VENTURI, ORIFICE        .
.........................................................................


.........................................................................
.AUTHOR TRESKE A Dr Ing                                  .PUB`N MUNICH       .
.........................................................TECHNICAL           .
.TITLE EXPERIMENTAL TESTING OF A MATHEMATICAL MODEL USED .UNIVERSITY, 44, 1980 .
.TO SIMULATE UNSTEADY FLOODFLOWS                         .                   .
.........................................................................
.DATA DISCHARGE, STAGE, VELOCITY, TIME, SLOPE,       .KEY WORDS MATHEMATICAL   .
.FRICTION FACTOR                                     .MODEL, PHYSICAL MODEL,   .
.....................................................UNSTEADY FLOW           .
.CHANNEL TYPE THRY, EXP, SMOOTH, COMP                .                        .
.........................................................................
.FL 210 M                 .FW 5.75, 7.0 M          .FD 0.52, 0.82 M           .
.........................................................................
.CL 210 M                 .CW 1.0, 1.25 M          .CD 0.3, 0.39 M            .
.........................................................................
.FCS 1.4 - 2.2(-4)   .Q 4 - 464 L/S        .INST POINT GAUGES                 .
.                    .                     .                                  .
.........................................................................
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AUTHOR TROPEA C

PUB’N EXPERIMENTS IN FLUIDS, 1, 1983

TITLE A NOTE CONCERNING THE USE OF A 1 COMPONENT LDA TO MEASURE SHEAR STRESS TERMS

DATA

KEY WORDS LASER DOPPLER ANEMOMETER

CHANNEL TYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST LASER DOPPLER ANEMOMETER

AUTHOR TURNER A K, LANGFORD K J, WIN M, CLIFT T R

PUB’N PASCE, J.I.D.D, VOL 104, IR 1, MARCH, 1978

TITLE DISCHARGE DEPTH EQUATION FOR SHALLOW FLOW

DATA REYNOLDS, DARCY WEISBACH, DISCHARGE, DEPTH, MANNINGS, VEGETATION DENSITY

KEY WORDS SHALLOW FLOW, VEGETATED SURFACE, ROUGHNESS

CHANNEL TYPE THRY, EXP, SIMP, RGH

FL 20, 20, 2.5, 1.25 M

FW 4.5, 0.6, 0.3, 0.15 M

FD

CL 20, 1.25 M

CW 4.5, 0.15 M

CD

FCS 2.5 - 7.6(-3)

Q 0.1 - 7 L/S

INST PIEZOMETERS, POINT GAUGE

AUTHOR UNITED STATES WATERWAYS EXPERIMENTAL STATION

PUB’N USWES, TECH MEMO., VICKSBURG, MARCH, 1956

TITLE HYDRAULIC CAPACITY OF MEANDERING CHANNELS IN STRAIGHT FLOODWAYS

DATA DISCHARGE, DEPTH, SINUOSITY, CHANNEL WIDTH RATIO, CHANNEL DEPTH RATIO

KEY WORDS SINUOSITY, OVERBANK ROUGHNESS,

CHANNEL TYPE EXP, COMP, SMTH, RGH, BEND

FL 100 FT

FW 16, 30 FT

FD

CL 100 FT

CW 1, 2 FT

CD 0.5 FT

FCS 1(-3)

Q 0.86 - 16.4 CUSECS

INST PIEZOMETERS

AUTHOR USLU O Dr Ing

PUB`N MUNICH TECHNICAL UNIVERSITY, 30, 1974

TITLE CALIBRATION OF ROUGHNESS PARAMETERS FOR MATHEMATICAL MODELS OF RIVERS WITH FLOODPLAINS

DATA

KEY WORDS MATHEMATICAL MODEL, COMPOUND CHANNEL, ROUGHNESS

CHANNEL TYPE THRY, PROT, RGH, COMP, BEND

FL	FW	FD
CL	CW	CD
FCS	Q	INST

AUTHOR UTAMI T, UENO T

PUB`N EXPERIMENTS IN FLUIDS, 2, 1984

TITLE VISUALIZATION AND PICTURE PROCESSING OF TURBULENT FLOW

DATA VELOCITY VECTORS, VECTOR FIELD, STREAMLINES, ROTATION COMPONENT, 2 D DIVERGENCE

KEY WORDS TURBULENCE, VISUALIZATION

CHANNEL TYPE EXP ,SIMPLE, SMOOTH

FL 12 M	FW 0.40 M	FD
CL 12 M	CW 0.40 M	CD 0.041 M
FCS 1(-3)	Q	INST CAMERA

AUTHOR VARSHNEY D V, GARDE R J

PUB`N PASCE, J HYD D, VOL 101, HY8, AUGUST, 1975

TITLE SHEAR DISTRIBUTION IN BENDS IN RECTANGULAR CHANNELS

DATA SHEAR DISTRIBUTION, LOGITUDINAL SHEAR, REYNOLDS NO

KEY WORDS SHEAR DISTRIBUTION, BENDS, RECTANGULAR CHANNELS

CHANNEL TYPE EXP, SIMPLE, ROUGH, BEND

FL 41, 52 FT	FW 2 FT	FD 2.5 FT
CL 41, 52 FT	CW 2 FT	CD 2.5 FT
FCS 6.7 - 40(-4)	Q 21.3 - 59 L/S	INST PRESTON TUBE

AUTHOR VEDULA S, ACHANTA R R
PUB`N PASCE, J HYD D, VOL 111, HY1, JANUARY, 1985
TITLE BED SHEAR FROM VELOCITY PROFILES : A NEW APPROACH

DATA VELOCITY DISTRIBUTION, VON KARMAN CONSTANT, REYNOLDS NO
KEY WORDS BED SHEAR, VELOCITY PROFILES, CHANNELS, PIPES

CHANNEL TYPE THRY, EXP, SIMP, PIPE

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR VREUGDENHIL C B, WIJBENGA J H A
PUB`N PASCE, J HYD D, VOL 108, HY11, NOVEMBER , 1982
TITLE COMPUTATION OF FLOW PATTERNS IN RIVERS

DATA VELOCITY, BED SHEAR STRESS,FLOW DISTRIBUTION, MEASURED AND COMPUTED VEL PROFILES
KEY WORDS FLOW PATTERNS, COMPUTATION

CHANNEL TYPE THRY, PROTO, EXP, COMP, RGH

FL R MAAS PHYSICAL HYD M
FW
FD

CL 7000 M
CW 200, 400 M
CD 9 M

FCS
Q 2000 - 3750 CUMECS
INST

AUTHOR de VRIEND H J, STRUIKSMA I N
PUB`N DELFT HYDRAULICS LABORATORY, 317, DECEMBER 1983
TITLE FLOW AND BED DEFORMATION IN RIVER BENDS

DATA VELOCITY, DEPTH, DISTANCE, BED PROFILE
KEY WORDS FLOW DEFORMATION, BENDS

CHANNEL TYPE THRY, EXP, RGH, BEND, SIMP

FL 47.32 M
FW 1.5 M
FD

CL 47.32 M
CW 1.5 M
CD

FCS
Q 0.047 - 0.061 CUMECS
INST MIN CURRENT METER

AUTHOR de VRIEND H J, GELDOF H J

PUB`N DELFT UNIVERSITY OF TECHNOLOGY, REPORT 83 - 6

TITLE MAIN FLOW VELOCITY IN SHORT AND SHARPLY CURVED RIVER BENDS

DATA ISOVELS, DEPTH, VELOCITY, SLOPE, SECONDARY FLOW, STAGE

KEY WORDS MATHEMATICAL MODEL, MAIN FLOW VELOCITY

CHANNEL TYPE PROTO, THEORY, SIMPLE, RGH

FL
FW
FD

CL 285 M
CW 6.1 M
CD 0.5 M

FCS 6.03 - 6.95(-4)
Q 1.21 - 1.53 CUMECS
INST CURRENT METER

AUTHOR de VRIEND H J

PUB`N DELFT UNIVERSITY OF TECHNOLOGY, REPORT 72 - 1

TITLE THEORY OF VISCOUS FLOW IN CURVED SHALLOW CHANNELS

DATA TANGENTIAL, RADIAL, SECONDARY, VERTICAL VELOCITY COMPONENTS, STREAM FUNCTION

KEY WORDS THEORY, VISCOUS FLOW, CURVED SHALLOW CHANNEL

CHANNEL TYPE THRY, SMTH, SIMPLE, BEND

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR de VRIEND H J

PUB`N DELFT UNIVERSITY OF TECHNOLOGY, REPORT 76 - 1

TITLE A MATHEMATICAL MODEL OF STEADY FLOW IN CURVED OPEN SHALLOW CHANNELS

DATA FLOW DISTRIBUTION, TRANSVERSE SLOPE COEFF, TRANSVERSE VEL, VELOCITY VECTORS, SHEAR

KEY WORDS MATHEMATICAL MODEL, STEADY FLOW, CURVED, SHALLOW

CHANNEL TYPE THY, EXP, SMTH, RGH, BD, SI

FL
FW
FD

CL
CW
CD

FCS
Q
INST

AUTHOR de VRIEND H J
PUB`N DELFT UNIVERSITY OF TECHNOLOGY, REPORT 81 - 3
TITLE STEADY FLOW IN SHALLOW CHANNEL BENDS (PARTS 1 & 2)
DATA DEAN NUMBER, VELOCITY PROFILES, SHEAR STRESS, SECONDARY FLOW, TURBULENCE VISCOSITY
KEY WORDS STEADY FLOW, CURVED CHANNEL,
CHANNEL TYPE THY, EXP, SMTH, RGH, BD, SI
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR WAGNER H
PUB`N IAHR, 1969, KYOTO, PROC 13 TH CONGRESS
TITLE LAMINAR FLOW IN OPEN RECTANGULAR CHANNELS
DATA BED SHEAR STRESS, WALL SHEAR STRESS, ASPECT RATIO
KEY WORDS LAMINAR FLOW, OPEN RECTANGULAR CHANNEL, SHEAR STRESS
CHANNEL TYPE THEORY, SIMPLE, SMOOTH
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR WALLACE J M, BRODKEY R S, ECKELMANN H
PUB`N J FLUID MECH, VOL 83, 4, DECEMBER, 1977
TITLE PATTERN RECOGNIZED STRUCTURES IN BOUNDED TURBULENT SHEAR FLOWS
DATA U, V, W VELOCITY COMPONENTS, NORMALIZED VEL COMPONENTS, AVERAGED VEL COMPONENTS
KEY WORDS PATTERN STRUCTURES, TURBULENT SHEAR FLOWS
CHANNEL TYPE EXP, SIMPLE
FL
FW 0.22 M
FD
CL
CW 0.22 M
CD
FCS
Q OIL
INST 2 COMPONENT HOT FILM ANEMOMETER

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................................................................................
.AUTHOR WALLIS S G, KNIGHT D W                           .PUB`N                .
.........................................................ESTUARINE,COASTAL    .
.TITLE CALIB STUDIES CONC A 1D NUMERICAL TIDAL MODEL     .AND SHELF SCIENCE,   .
.WITH PART REF TO RESISTANCE COEFFICIENTS                .1984, 19             .
................................................................................
.DATA STAGE, VELOCITY, MANNINGS N, SLOPE, CHAINAGE   .KEY WORDS BOUNDARY SHEAR .
.                                                    .STRESS, RESISTANCE,      .
.....................................................TIDAL                    .
.CHANNEL TYPE THRY, PROTO, SIMPLE                    .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
................................................................................
.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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.AUTHOR WATTS F J, SIMONS D B, RICHARDSON E V            .PUB`N PASCE, J HYD   .
.........................................................D, 93, HY6,          .
.TITLE VARIATION OF ALPHA AND BETA VALUES IN A LINED     .NOVEMBER, 1967       .
.OPEN CHANNEL ( INC DISCUSSIONS )                        .                     .
................................................................................
.DATA ISOVELS, ENERGY COEFFICIENT (ALPHA), MOMENTUM  .KEY WORDS MOMENTUM,      .
.COEFFICIENT (BETA), ASPECT RATIO                    .ENERGY, OPEN CHANNEL     .
......................................................                         .
.CHANNEL TYPE PROTO, SIMP, SMTH, BEND                .                         .
................................................................................
.FL 413, 3144 FT         .FW 7, 12 FT              .FD                         .
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.CL 144, 245 FT          .CW 7, 12 FT              .CD                         .
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.FCS 2 - 13(-4)      .Q 187 - 1324 CUSECS  .INST CURRENT METERS                .
.                    .                     .                                   .
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.AUTHOR WEISS H W, MIDGLEY D C                           .PUB`N PASCE, J HYD   .
.........................................................D, VOL 104, HY3,     .
.TITLE SUITE OF MATHEMATICAL FLOOD PLAIN MODELS          .MARCH, 1978          .
.                                                        .                     .
................................................................................
.DATA CELL ARRANGEMENT, SIMULATED & OBSERVED         .KEY WORDS FLOOD ROUTING  .
.SEDIMENTATION DEPTHS, FLOOD DAMAGE FREQUENCY        .MODEL                    .
......................................................                         .
.CHANNEL TYPE THRY, PROTO, RGH, COMP                 .                         .
................................................................................
.FL                      .FW                       .FD                         .
................................................................................
.CL                      .CW                       .CD                         .
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.FCS                 .Q                    .INST                               .
.                    .                     .                                   .
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AUTHOR WHITE W R, WHITEHEAD E

PUB`N HYDRAULICS RESEARCH STATION, INT 98, DEC, 1971

TITLE THE PERFORMANCE OF PIEZOMETRIC TAPPINGS

DATA DIMENSIONLESS PRESSURE AND WALL SHEAR STRESS, REYNOLDS NO, FRICTION FACTOR, TAPPING DIA

KEY WORDS PIEZOMETRIC TAPPINGS, PRESTON TUBE

CHANNEL TYPE EXP, DUCT, SMOOTH, ROUGH

FL 10 M
FW 4 IN
FD 8 IN

CL 10 IN
CW 4 IN
CD 8 IN

FCS
Q
INST PRESTON TUBE

AUTHOR WOERNER J L, JONES B A, FENZL R N

PUB`N PASCE, J HYD D, VOL 94, HY3, MAY, 1968

TITLE LAMINAR FLOW IN FINITELY WIDE RECTANGULAR CHANNELS

DATA VELOCITY DISTRIBUTION, ASPECT RATIO, SIDE WALL FUNCTION, FRICTION FACTOR, REYNOLDS NO

KEY WORDS LAMINAR FLOW, RECTANGULAR CHANNELS

CHANNEL TYPE EXP, SIMPLE, SMOOTH

FL 20 FT
FW 10.021 IN
FD 20 IN

CL 4 FT
CW 2.002, 10.021 IN
CD 6 IN

FCS 1.23 - 6.83(-4)
Q 0.000291 - 0.01221 CUSECS
INST VOLUMETRIC TANK, PEIZOMETRIC TAPPINGS, POINT GAUGES, PITOT TUBE

AUTHOR WORMLEATON P R, ALLEN J, HADJIPANOS P

PUB`N PASCE, J HYD D, VOL 108, HY9, SEPTEMBER, 1982

TITLE DISCHARGE ASSESSMENT IN COMPOUND CHANNEL FLOW

DATA APPARENT SHEAR, DEPTH, DISCHARGE RATIOS

KEY WORDS DISCHARGE ASSESSMENT,COMPOUND CHANNEL

CHANNEL TYPE EXP, COMP, SMOOTH, ROUGH

FL 10.75 M
FW 1.21 M
FD 0.40 M

CL 10.75 M
CW 0.29 M
CD 0.12 M

FCS 4.3 - 18.0(-4)
Q 9 - 48 L/S
INST PRESTON TUBE, ADJ WEIR, POINT GAUGE, DALL TUBE, MANOMETER

AUTHOR WORMLEATON P R, HADJIPANOS P
PUB`N ASCE, J HYD ENG, VOL 111, 2, FEBRUARY, 1985
TITLE FLOW DISTRIBUTION IN COMPOUND CHANNELS
DATA VELOCITY, MOMENTUM ENERGY FLUX, KINETIC ENERGY FLUX
KEY WORDS FLOW DISTRIBUTION, COMPOUND CHANNELS
CHANNEL TYPE EXP, THRY, COMP, SMTH, RGH
FL 10.75 M
FW 1.21 M
FD 0.4 M
CL 10.75 M
CW 0.29 M
CD 0.12 M
FCS
Q
INST MIN CURRENT METER, ADJ WEIR, POINT GAUGE, DALL TUBE

AUTHOR WORMLEATON P R, ALLEN J, HADJIPANOS P
PUB`N 17 CONVENTION ON HYD AND HYD CONST, PALERMO, 1980
TITLE THE EFFECTS OF SPACING OF HEMISPERICAL ELEMENTS ON THE HYD RESISTANCE OF OPEN CHANNELS
DATA CHEZY, RELATIVE ROUGHNESS, ROUGHNESS PARAMETER,COLEBROOK-WHITE
KEY WORDS HEMISPHERICAL ELEMENTS, HYD RESISTANCE, OPEN CHANNELS
CHANNEL TYPE EXP, SIMPLE, SMOOTH, ROUGH
FL 6 M
FW 0.3 M
FD
CL 6 M
CW 0.3 M
CD
FCS 4.3 - 25.8(-4)
Q 0.00065 - 0.01245 CUMECS
INST POINT GAUGE, VOLUMETRIC TANK, ADJ WEIR

AUTHOR WORMLEATON P R, ALLEN J, HADJIPANOS P
PUB`N PASCE, J HYD D, VOL 106, HY5, MAY, 1980
TITLE INTERACTION BETWEEN MAIN CHANNEL AND FLOODPLAIN FLOWS (DISCUSSION)
DATA
KEY WORDS INTERACTION, MAIN CHANNEL, FLOODPLAIN
CHANNEL TYPE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR WORMLEATON P R, ALLEN J, HADJIPANOS P

PUB`N PASCE, J HYD D, VOL 109, HY11, NOVEMBER, 1983

TITLE DISCHARGE ASSESSMENT IN COMPOUND CHANNEL FLOW (CLOSURE)

DATA OBSERVED DISCHARGE, CALCULATED DISCHARGE, DEPTH RATIO, ZERO SHEAR INTERFACE, ROUGHNESS

KEY WORDS DISCHARGE ASSESSMENT, COMPOUND CHANNEL FLOW

CHANNEL TYPE

FL

FW

FD

CL

CW

CD

FCS

Q

INST

AUTHOR WRIGHT R R, CARSTENS M R

PUB`N PASCE, J HYD D, VOL 96, HY9, SEPTEMBER, 1970

TITLE LINEAR MOMENTUM FLUX TO OVERBANK SECTIONS

DATA ISOVELS, BOUNDARY SHEAR STRESS, PERIMETRIC DISTANCE

KEY WORDS LINEAR MOMENTUM FLUX, COMPOUND CHANNEL, SHEAR STRESS

CHANNEL TYPE EXP, DUCT, COMP, SMOOTH

FL 20 FT

FW 10 IN

FD 3, 5 IN

CL 20 FT

CW 5 IN

CD 1 IN

FCS

Q AIR

INST PRESSURE TAPPINGS, PRESTON TUBE, TRANSDUCER, MANOMETER, PITOT TUB

AUTHOR YEN C L, OVERTON D E

PUB`N PASCE, J HYD D,VOL 99, HY1, JANUARY, 1973

TITLE SHAPE EFFECTS ON RESISTANCE IN FLOOD PLAIN CHANNELS

DATA RESISTANCE COEFF, BOUNDARY SHEAR, CONVEYANCE, SHEAR DIVISION LINES

KEY WORDS SHAPE EFFECTS, RESISTANCE, FLOOD PLAIN CHANNELS

CHANNEL TYPE THEORY, EXP, ROUGH

FL

FW 3, 6 FT

FD

CL

CW 0.93 FT

CD 0.6, 1.40 FT

FCS 1.4 - 3.5(-3)

Q 5.35 - 11.15 CUSECS

INST

AUTHOR YEN C L, HO S Y
PUB`N PASCE, J HYD D, VOL 111, HY5, MAY, 1985
TITLE FLOOD PLAIN AND MAIN CHANNEL FLOW INTERACTION (DISCUSSION)
DATA DEPTH VARIATION, PROPORTIONAL DISCHARGE, ZERO SHEAR INTERFACE, ASPECT RATIO
KEY WORDS FLOODPLAIN, MAIN CHANNEL, FLOW INTERACTION
CHANNEL TYPE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR YEN C L, HO S Y
PUB`N PASCE, J HYD D, VOL 109, HY11, NOVEMBER, 1983
TITLE DISCHARGE ASSESSMENT IN COMPOUND CHANNEL FLOW (DISCUSSION)
DATA ZERO SHEAR INTERFACE, FLOODPLAIN PARAMETER
KEY WORDS DISCHARGE ASSESSMENT, COMPOUND CHANNEL FLOW
CHANNEL TYPE
FL
FW
FD
CL
CW
CD
FCS
Q
INST

AUTHOR YEN C L, YEN B C
PUB`N PASCE, J HYD D, VOL 97, HY2, FEBRUARY, 1971
TITLE WATER SURFACE CONFIGURATION IN CHANNEL BENDS
DATA SURFACE SLOPE COEFFICIENT, SUPERELEVATION COEFF, BED TOPOGRAPHY, WATER SURFACE CONTOURS
KEY WORDS WATER SURFACE CONFIGURATION, CHANNEL BENDS
CHANNEL TYPE THRY, EXP, SIMPLE, BEND
FL 102 FT
FW 7.66 FT
FD
CL 102 FT
CW 6, 7.66 FT
CD
FCS
Q
INST

AUTHOR YOON S E, LEE J T, LEE W H

PUB`N 5 TH CONG, ASIAN & PACIFIC REG DIV, IAHR, AUG, 1986

TITLE FLOW CHARACTERISTICS IN SHALLOW CHANNEL BENDS

DATA VELOCITY DISTRIBUTION, WATER LEVEL, DISTANCE, TRANSVERSE WATER LEVEL, SUPERELEVATION, BEND ANGLE

KEY WORDS FLOW, SHALLOW BENDS

CHANNEL TYPE THRY, EXP, SIMP, SMTH, BEND

FL 25.76 M	FW 1.7 M	FD
CL 13.35 M	CW 1.7 M	CD 0.18 M
FCS	Q 0.187 CUMECS	INST

AUTHOR ZHELEZNYAKOV G V

PUB`N IAHR CONGRESS, 1971, PARIS, VOL 5

TITLE INTERACTION OF CHANNEL AND FLOODPLAIN STREAMS

DATA DISCHARGE, VELOCITY, STAGE, KINEMATIC CONSTANTS

KEY WORDS KINEMATIC EFFECT, INTERACTION, CHANNEL, FLOODPLAIN

CHANNEL TYPE EXP, THY, COMP, SMTH, ROUGH

FL	FW 3.5 M	FD
CL	CW 0.3 M	CD
FCS	Q 0 - 120 L/S	INST

AUTHOR ZHELEZNYAKOV G V

PUB`N IAHR, 1965, LENINGRAD, PROC 11 TH CONGRESS

TITLE REL DEFICIT OF MEAN VEL OF UNSTABLE RIVER FLOW, KIN EFFECT IN RIVER BEDS WITH FLOOD PLNS

DATA VELOCITY, STAGE, DISCHARGE CAPACITY

KEY WORDS KINEMATIC EFFECT, FLOOD PLAIN

CHANNEL TYPE PROTO, EXP, COMP, ROUGH

FL	FW 1.35, 21.42 M	FD
CL	CW 0.20, 2.1 M	CD 0.06 M
FCS 3.0 - 30(-4)	Q 0.002 - 0.190 CUMECS	INST

AUTHOR ZHELEZNYAKOV G V, NOVIKOVA N M

PUB`N IAHR, 1973, ISTANBUL, PROC 15 TH CONGRESS

TITLE KINEMATIC EFFECT OF THE FLOW IN ERODIBLE CHANNELS

DATA MEAN VEL, WATER LEVEL

KEY WORDS KINEMATIC EFFECT, ERODIBLE CHANNELS

CHANNEL TYPE EXP, COMP, ROUGH

FL 14.3, 23 M	FW 0.98, 3.88 M	FD
CL 14.3, 23 M	CW 0.35, 2.62 M	CD 0.26, 0.48 M
FCS 1(-3)	Q 2.5 - 133 L/S	INST THERMOHYDROMETER, TRANSDUCER POINT GAUGE, DALL TUBE

4 PRECIS OF PAPERS

The precis of papers relating to turbulence and flow characteristics in channels, ducts and pipes was compiled on the Apricot Xi-10 micro computer using Wordstar 3.40 supplied by Micro Pro.

This file indicates the aims and conclusions as detailed in the papers as well as the channel types investigated and instruments used in the experimental work.

The channel type detailed is described either as an experimental (flume), prototypical (river, irrigation canal) or theoretical (mathematical, computational) channel.

Channel form is detailed as simple; rectangular flume, channel or duct; or compound, a channel in which the geometry of the cross-section changes significantly at one particular elevation, giving rise to the discontinuity in the shape of the channel.

Smooth flumes, channels or ducts are considered to be formed of wood, steel floated concrete, glass or perspex. Rough channels are considered to be flumes and ducts with artificial roughening elements attached to the channel surface or river channels whose boundaries are considered to be naturally rough.

The aims, conclusions and details of instrumentation used are self explanatory.

......Precis of papers

This file is intended to indicate the aims and conclusions as detailed in papers relating to turbulence flow characteristics in channels. The file is presented in the form:

1. Channel type
2. Aims
3. Conclusions
4. Instruments

ABRAHAM, HOLLEY, SIEMONS 1972

Some aspects of analysing transverse diffusion in rivers

1. Theory, prototype, simple

2. To investigate diffusion coefficients, in particular variation of depth, longitudinal velocity and diffusion coefficient within the cross section and transverse velocities. General change of moments method developed to calculate diffusion coefficients incorporating these considerations

3. Method indicates that transverse velocities are as important as diffusion in respect of spreading

4. -

ADACHI 1962

The effects of side walls in rectangular cross sectional channel

1. Theory, experimental, simple

2. To re examine the intuitional assumptions and explain a principle of estimating the effects of side walls on turbulent flow in a rectangular cross sectional channel.

3. Resistance formula for turbulent flow in an open channel with rectangular cross section is presented. Channel width is a significant factor in estimating the side wall effect. Basis of the assumptions of the partition method for determining side wall effect is explained. Momentum correction factor formula presented.

4. -

ADACHI 1964

On the artificial strip roughness

1. Experimental, simple, rough

2. To investigate the effect of artificial strip roughness on flow and to develop an empirical logarithmic roughness formula

3. Equivalent sand roughness does not always correspond to the roughness pattern and varies with flow depth. For strip elements with a relative spacing of 8 to 160 it may be neccessary to introduce a transitional flow pattern between wake interference flow and isolated roughness flow. A relative roughness spacing of 8 is a useful criterion for distinguishing the ridge and groove roughness. For ridge roughness the datum is set on the base of the flume, for the groove roughness on the surface of the ridge. The empirical logarithmic roughness formula for the ridge roughness with the incomplete wake interference flow developed in terms of the relative roughness height and the relative ridge spacing

4 Point gauges, peizometric tapping, electronic point gauge

AHMED, BRUNDRETT 1971

Characteristic lengths for non circular ducts

1. Theory, experimental, simple, duct

2. To identify characteristic lengths for non circular ducts due to the lack of correlation of the turbulent flow of non circular ducts with that of circular pipes when using the hydraulic diameter as the characteristic length.

3. Characteristic length is suggested which takes into account the shape of the highest and lowest curvature of the isovels.

4. -

ALFRINK 1982

Value of refined turbulence modelling for the flow over a trench

1. Theoretical, experimental, compound, smooth

2. To study turbulent flow in a trench perpendicular to the main flow direction

3. Relating turbulence and diffusion constants to roughness allows prediction of steady flow conditions

4. -

ALLEN, CHEE 1962

The resistance to the flow of water round a smooth circular bend in an open channel

1. Bend, smooth

2. Clarify scale effects in open channel bends

3. Head loss affected by depth, Froude and Reynolds. Scale effect reduced by exaggerating vertical scale, exaggeration depends on horiz scale and width/depth ratio of channel. Resistance caused by bend is influenced by width/depth ratio and Reynolds.

4. Point gauge, volumetric tank, adjustable weir

ALLEN, ULLAH 1967

The flow of water through smooth open channels of narrow rectangular and T shaped cross sections

1. Compound, smooth, experimental

2. Study water flow through narrow section compound channels with specific reference to critical Reynolds, Friction factor and velocity distribution

3. Velocity pattern related to laminar, transitional and turbulent flow. Friction factor is constant at critical Reynolds No. Laminar and Turbulent flow can co exist in a compound channel

4. Point gauge, Min current meter, Volumetric tank, Floats

VAN ALPHEN, BLOKS, HOEKSTRA 1984

Flow and grainsize pattern in a sharply curved river bend

1. Prototype, simple, rough, bend

2. To verify mathematical model prediction of main flow velocity field as proposed by Kalkwijk and de Vriend, to gain insight into secondary circulation and its effect on bed shear stress, to obtain information on grainsize and bedform dimensions

3. Bed shear stress distribution is skewed outward. Secondary circulation develops in a downstream direction. In upstream part of bend streamwise shear stress governs grainsize distribution. Coarsest material found near outside of bend, maximum depth averaged flow velocity near inner bank. In bend apex region secondary flow restricted to thalweg. In downstream part of bend secondary circulation is strongly developed and spreads laterally.

4. Current meter, Electro magnetic current meter

AMERICAN SOCIETY OF CIVIL ENGINEERS 1963

Friction factors in open channels..... Task force

1. Pipes and Channels, smooth and rough, experimental and prototype

2. Summarizes current thought to 1960 on friction in open channels

3. Darcy Weisbach f more relevant than Mannings n for expressing resistance to steady fully developed flow in uniform channels. Mannings useful for fully rough flow. For smooth and partly rough flow Moody resistance diagram can be used to estimate f. Review of development of fixed bed, open channel resistance formulae

4. -

ANANYAN 1965

Fluid flow in bends of conduits Contains chapters on:

Basic equations of motion of a turbulent stream through a conduit bend.

Analysis of liquid flow through a conduit bend.

Development of transverse circulation at the bend of a conduit and its damping beyond the bend.

Experimental study of the motion of a liquid through a conduit bend.

Application of the developed theory to the solution of several practical problems.

ANDREOPOULOS, DURST, ZARIC, JOVANOVIC 1984

Influence of Reynolds number on characteristics of turbulent wall boundary layers

1. Experimental, smooth, duct

2. To measure wall boundary layer flows, particularly the near wall region, for high Reynolds numbers

3. Sublayer flow region independent of Reynolds number. Turbulent velocity fluctuations depend on Reynolds up to 10(4). Bursting cycle not found to be independent of Reynolds

4. Hot wire anemometer

ANWAR 1986

Low Reynolds number turbulent flow in laboratory flume

1. Experimental, simple, rough

2. To determine turbulence intensities, Reynolds stresses, skin friction, shape factor and length scale within turbulent parameters along with mean velocity profile, energy spectra and bursting events.

3. Mean velocity profiles are logarithmic, von Karman constant is 0.4. Skin friction coefficient and shape factor are higher than those from wind tunnel experiments. Turbulence intensity in mean flow direction dependent on Reynolds no, less so in vertical direction. Length scales determined from auto correlation coefficients of vertical and horizontal velocity components. Length scale of horizontal velocity auto correlation only dependent on Reynolds no. Mean duration period of an ejection originating from bed is comparable with the time scale obtained from vertical velocity auto correlation coefficient. Peaks of energy spectra of vertical velocity and of co spectra occur almost at the same non dimensional wave numbers

4. Miniature current meter, two component ultra sonic current meter

ANWAR 1986

Turbulent structure in a river bend

1 Prototype, simple, rough

2 To determine the terms required for calculating the flow around a bend, and also to show that the effect of the bend on the Reynolds stresses diminished at a short distance downstream from the bend. Field study used to overcome uncertain scale effects encountered in laboratory experiments

3 In straight reach upstream of bend the velocity profile in the mean flow direction was logarithmic. Isovels at bend entrance not affected by flow curvature. Mean lateral velocity became appreciable in the bend. Equal contours of the normal stresses, in three directions, at the bend entrance were affected by the curved flow. The Reynolds stress in the mean flow direction at the bend entrance was sensitive to the curved flow. Maximum value of the lateral Reynolds shear stress occured near the outer bank at the bend entrance. The turbulent production term for the lateral direction was large near the outer region decreasing toward the inner bank and bend exit

4 Two component electro magnetic current meter

ANWAR, ATKINS 1982

Turbulent structure in an open channel flow

1 Experimental, simple, smooth

2 To investigate the statistical properties of turbulence burst phenomena and their contribution to Reynolds shear stress, duration of burst, frequency of burst and time period between occurrence

3 From the measured data the auto correlation functions and the energy spectra of the horizontal and vertical velocity fluctuations and their product have been evaluated.

4 Electromagnetic current meter, twin wire wave probes

APMANN 1972

Flow processes in open channel bends

1 Theoretical, protoype, simple, rough, bend

2 Identifies need for method to calculate maximum shear stress in a river bend by semi empirical calculation methods

3 Compares shear stress values derived from field measurement on a channel bend with experimental data with a brief review of existing methodology

4 Point gauges

ARANOVITCH 1971

A method for the determination of the local turbulent friction factor and heat transfer coefficient in generalised geometries

1. Theory, experimental, complex, ducts

2. Proposal of method for determination of the velocity distribution of the local heat transfer and friction factor for fully developed turbulent flows of fluids of constant properties through ducts of arbitrary cross section with a prescribed heat flux distribution at the wall.

3. Theoretical/experimental comparison show satifactory agreement. Limitation of method reached where the local wall curvature becomes too small compared to the average hydraulic diameter or in the vicinity of tangent surfaces. The existence of secondary flows has been neglected. Steady state conditions have been assumed.

4. -

ASANO, HASHIMOTO, FUJITA 1985

Characteristics of variation of Mannings roughness coefficient in a compound cross section

1. Experimental, compound, smooth, rough, prototype

2. To investigate the equivalent roughness coefficient of a compound channel based on hydraulic model experiments

3. Equivalent roughness coefficient increases with increasing water level especially when the channel/floodplain width ratio is < 0.4. Tendency explained by reference to a mixing coefficient for the interaction between channel and floodplain flow which has a value of the order of 0.2. As depth increases coefficient reduces to 0.045.

4. Point gauge, miniature current meter.

ATKINS 1980

Turbulence measurements using a small electro magnetic current meter in open channel flows

1. Experimental, smooth, simple

2. To investigate accelerating and decelerating flows

3. Mean velocity profiles, water surface slopes, bed friction velocities and turbulence intensity profiles identified

4. Electro magnetic current meter, miniature current meter

BAIRD, ERVINE 1984

Resistance to flow in channels with overbank floodplain flow

1. Experimental, compound, smooth

2. Details of experimental results of flume study into the hydraulic behaviour of channels with overbank floodplain flow.

3. Friction factor/Reynolds no;Boundary shear stress distribution;velocity distribution and non dimensional stage discharge relationships detailed

4. Preston tube, pitot tube

BARISHNIKOV, IVANOV, SOKOLOV 1971

Role of floodplain in flood discharge of a river channel

1. Compound, rough, smooth, experimental

2. To reveal physical processes present with various degrees of flow interaction. Investigate flow from floodplain to main channel and vice versa. Interaction of flows with intersecting axes

3. Channel floodplain flow interaction reduces flow discharge capacity of 10 to 16% attributed to channel. Reduction due to vortex formation, momentum transfer and secondary currents. Recommend TOEBES and SOOKY calculation method for aligned flows. Flow attributed to channel and floodplain is reduced by up to 43% for flow from floodplain to channel and by an increase of up to 11% for flow from channel to floodplain Discharges reduce markedly when flow axes intersect. Due to vortex formation etc plus slope reduction in interaction zone

4. -

BARR 1978

A new approach to fully graphical (dimensional) solution of the Colebrook-White function

1. Theory, experimental, rough.

2. Basis of Acker`s system of dimensional design charts is outlined and an alternative approach to fully dimensional working of the standard pipe flow is proposed.

3. No requirement for numerical calculations where circular pipes flowing full are concerned. System based on water at normal temperature being the fluid flowing. Adjustment possible to accomodate fluids of other kinematic viscosity. Method can be applied to non circular conduits by making use of equivalent pipe factor as proposed by Johnson and Ackers.

4. -

BARR, DAS 1986

Direct solutions for normal depth using the Manning equation

1. Theory, experimental, simple, rough

2. Explicit solution procedure provided for the inherently implicit problem of the determination of normal depth.

3. Procedure comprises a numerical solution for rectangular channels, and both numerical and graphical procedures for trapezoidal channels and for circular conduits running part full. Resulting errors always remain within design limits. Semi graphical solution easier to use than methods proposed by Chow or Jeppson.

4. -

BARRAGE 1979

Research into turbulence and suspended sediment in rivers

1. Prototype, simple, rough

2. To investigate river velocity, turbulence and suspended sediment characteristics

3. Statistical evaluation of turbulence measurements presented and related to suspended load

4. Pressure probe

BATHURST 1978

Flow resistance of large scale roughness

1. Simple, rough, prototype

2. To investigate flow resistance of large scale roughness. Basic theory presented and tested against field data.

3. Resistance to flow in conditions of large scale roughness depends mainly on the roughness geometry, varies only with channel geometry in respect of that parameters effect on the drag of the roughness elements. Roughness spacing can be defined in terms of boulders protruding through flow

4. Current meters

BATHURST 1979

Distribution of boundary shear stress in rivers

1. Prototype, simple, rough

2. To study field data collected at sections across rivers with cobble beds and to delineate patterns of shear stress distribution and the variations which occur with changes in discharge

3. Distribution of shear stress at a section depends mainly on primary and secondary flow effects. In straight reaches shear stress distribution is affected by stress induced secondary circulation and by acceleration or deceleration of flow. At bends the magnitudes and positions of shear stress peaks are determined by the relative influence of skew induced circulation. Cross sectional distribution of shear stress becomes more uniform as Reynolds number increases. Longstream changes in shear stress cause erosion and deposition

4. Current meter

BATHURST (to be published)

Flow processes and data provision for channel flow models

1. Prototype, theoretical, simple, compound, rough

2. Indicates that processes representing flow resistance and interaction between channel and flood plain flows are poorly reproduced by existing models.

3. Advances in data provision and the understanding of field processes needed to match those in numerical techniques.

4. -

BATHURST, THORNE, HEY 1977

Direct measurement of secondary currents in river bends

1. Prototype, simple, rough

2. To report on measurement of longstream and cross stream velocities carried out across sections of a river perpendicular to the outer banks of several bends using an electromagnetic flow meter

3 Presence of single and compound cells including reverse cells detailed. Reverse cell form dependent on bank form.

4 Electromagnetic current meter

BATHURST, THORNE, HEY 1979

Secondary flow and shear stress at bends

1 Simple, rough, prototype

2 To investigate current pattern adjacent to river banks, their variation with discharge and relationship to boundary shear stress distribution. Current knowledge reviewed

3 Uniformity of shear stress depends on secondary circulation strength. The secondary circulation is strongest at medium discharges and then does not possess the uniformity of shear stress in a straight channel

4. Electro magnetic flowmeter

BATHURST, THORNE, HEY 1981

Secondary flow and shear stress at river bends

Closure of paper presented in 1979

BATHURST, LI, SIMONS 1981

Resistance equation for large scale roughness

1. Theoretical, experimental, simple, rough

2. To identify the processes affecting the flow hydraulics in respect of large scale roughness, construct a theory of flow resistance and test the theory by using flume data to develop a theoretical flow resistance equation.

3. Flow resistance of large scale roughness depends upon the form drag of the elements and their disposition in the channel. Relevant flow processes can be described as functions of Reynold`s number, Froude number, roughness geometry and channel geometry

4. Point gauge

BERTRAM 1985

Flow in trapezoidal channels with extreme bank roughness

1. Experimental, theory, simple, rough

2/3. To investigate the effect of bank vegetation on conveyance in a channel and to develop a numerical method to calculate flows.

4. Point gauge, pitot tube, miniature current meter

BHOWMIK 1982

Shear stress distribution and secondary currents in straight open channels

1. Experimental, theoretical, prototype, simple, rough

2. Analysis of present state of knowledge of shear stress distribution and secondary currents in straight open channels

3. Attempt to consider only gravel bed rivers, however most past work on laboratory flumes and sand bed streams. Direct and indirect methods of shear stress measurement detailed. Proposed standard definition of secondary current. Need to develop instrument to measure secondary currents in the field. Discussions by Church, Thorne, Bathurst, Hey, de Ruiter, de Vriend

4. -

BHOWMIK, DEMISSIE 1982

Carrying capacity of floodplains

1 Compound, rough, prototype

2 To determine floodplain/main channel flow distribution

3 Relates conveyance to return period. Refers to RAJARATNAM and AHMADI

4 -

BLACK 1982

Minimum specific energy in compound open channel

Discussion of paper by Blalock, Sturm 1981

BLALOCK, STURM 1981

Minimum specific energy in compound open channel

1 Compound, smooth, experimental

2 To present an analytical formulation of a compound channel Froude number which identifies the occurrence of points of minimum specific energy for flow in compound open channels

3 Compound channel Froude no derived which reflects the specific energy curve of flow in a compound channel by locating points of minimum specific energy

4 -

BLALOCK, STURM 1983

Minimum specific energy in compound open channel

Closure on discussion of paper

BLENCH 1969
MOBILE BED HYDRAULICS

1 Prototype, circular, theory, rough.

2 A formulization of general theory of a river bed development and sediment transport in a stream along the lines which initiated the friction factor diagram of rigid boundary hydraulics for circular pipes.

3 The form of discontinuity is different for sand than for gravel but cannot be carried through due to small range in D. The graphs taken as a whole cannot show the major peculiarities due to variation of d/D.

4 -

BLINCO, PARTHENIADES 1970

Turbulence characteristics in free surface flows over smooth and rough boundaries.

1 Experimental, smooth, rough, simple.

2 Study of the effects of boundary roughness and Reynolds no. on the turbulence intensity in the direction of the flow as measured in an open channel flume.

3 The results of this study suggest the existence of a universal equation relating turbulece intensities to boundary shear, kinematic viscosity and relative distance from the boundary.

4. Orifice meter, weir, hot film probe, anenometer,

BRADBURY, DURST, LAUNDER, SCHMIDT, WHITELAW 1983

Turbulent shear flows

Selected papers from 4th International symposium on turbulent shear flows

Comprising chapters on
Fundamentals
Free flows
Boundary layers
Reacting flows

BRADSHAW 1976

Turbulence

Contains chapters on

Introduction to turbulence
External flows
Internal flows
Geophysical turbulence and buoyant flows
Calculation of turbulent flows
Heat and mass transport
Two phase and non Newtonian flows

de BRAY 1967

Some investigations into the spanwise non uniformity of nominally two dimensional incompressible boundary layers downstream of gauze screens

1 Experimental, duct, simple, smooth

2 To assess the importance of the type of screen for use in wind tunnels by changing the open area ratio, number of screens and type of honeycomb

3 Non uniformities in the air flow downstream of the gauze screens persist through the contraction and test section. Honeycomb mesh and directional uniformity has a powerful influence on the magnitude of the boundary layer variations. Type of screen is the main controlling factor for the non uniformity in conventional tunnels. With more than one screen the open area ratio of the downstream screen has most effect. Honeycomb of fine mesh gave better results than screens. Effect of contraction shape is small. Wall curvature substantially effects non uniformity. Little variation in boundary layer either in test section or in the entry region. Effect of the pressure gradient along a flat surface with fixed transition was negligible. When pressure gradient is used to control the position of free transition, boundary layer normality is strongly influenced by the closeness of transition to the measuring plane. Laminar boundary layers shwed greater fractional variations than the turbulent boundary layers further downstream on the same surfaces.

4 Preston tube, static tube

BROOKS, SHUKRY 1963

Boundary shear stresses in curved trapezoidal channels (IPPEN, DRINKER)

Discussion

1 Simple, smooth, experimental

2/3 Initial paper proposes uniform energy dissipation round a bend. Point is questioned due to non uniformity of flow in bend from experiment. Orientation of shear stress neglected in considering bank stability. Considered that important to look at x, y and z flow components to understand shear stress at bends

4 -

BROWN, JOUBERT 1969

The measurement of skin friction in turbulent boundary layers with adverse pressure gradients

1 Experimental, theoretical, simple, smooth, duct

2 To discuss the methods of skin friction measurements available, and describe the instrument which has been developed, its calibration, and describe the secondary effects on the instrument of pressure gradients in two dimensional flow.

3 Parameter defined that represents failure of Preston tube in severe adverse pressure gradients. Maximum secondary force value found to be 15% of the wall shear stress force. Secondary force shows some correlation with pressure gradient and Reynolds number.
Secondary forces on the element of a floating element instrument due to the effects of a pressure gradient, and to the distortion of the boundary layer.

4 Shear stress meter, Preston tube, static tube, piezometric tappings

BROWNLIE 1981

Re-examination of Nikuradse roughness data

Paper describes inconsistency in the original presentation of the Nikuradse data and provides a Moody type diagram with some engineering applications for a range of data believed to be valid

BRUNDRETT, BAINES 1964

The production and diffusion of vorticity in duct flow

1 Duct, smooth, experimental

2 Discussion on origin and dissipation of secondary flows in square ducts with experimental proof

3 Secondary flow characteristic described but eddy structure that produces the Reynolds stress gradients so inducing secondary flow not identified

4 Hot wire anemometer

BUCHANAN, POSEY, YEN, HO 1983

Discharge assessment in compound channel flow (WORMLEATON, ALLEN, HADJIPANOS)

Discussion

1 Compound, smooth, rough, experimental

2/3 Proposes treating channel as single entity with averaged Mannings n between channel and floodplain as compared to paper using fictitious horizontal interface at bankful for main channel. Discrepancy between observed/predicted value for discharge reduces from +/- 20% to +3% to -15% Proposes method dividing flow into zones separated by planes of zero shear as compared to vertical, diagonal and horizontal interfaces

4 -

BUTLER, ROCK, WEST 1978

Friction coefficient variation with flow in an urban stream

1 Prototype, simple, smooth, rough

2 To investigate the variation of Mannings n with varying stage

3 Dependence of Mannings n on river flow for lined and unlined channels demonstrated

4 Current meter, staff gauge

CALLANDER 1978

River meandering

1 Prototype, experimental, theory, simple, rough, smooth, meanders

2 To explain the flow processes in a meandering channel and to describe current research

3 Review classifies research on meanders on the basis of field measurements, flow in bends and explanations of meandering. Fundamental problem of field measurement is to find empirical relationship between the geometrical properties of a river and the flow within the river. Flow in bends studied in the field and using laboratory flumes as well as by theoretical analysis. Latter hampered by lack of knowledge of physical processes present in the flow. Explanation of meandering still not determined though case for dynamic instability considered important.

4 -

CARLSON, IRVINE 1961

Fully developed pressure drop in triangular shaped ducts

1 Experimental, simple, smooth, duct

2 To obtain pressure drop data for ducts with narrow isoceles triangular cross sections

3 Using the equivalent hydraulic diameter measurements agreed closely with calculated results in the laminar regime. In the turbulent regime the predicted values were 20% too high. Using the apex angle and hydraulic diameter as correlating parameters gave agreement within 2% for Reynolds numbers between 5000 and 30000.

4 Piezometric tappings

CEBECI, SMITH 1974

Analysis of turbulent boundary layer

Contains chapters on:

Introduction to turbulence
Conservation equations for compressible turbulent flows
The boundary layer equations
General behaviour of turbulent boundary layers
Various approaches to the calculation of turbulent boundary layers
Transport coefficients in turbulent boundary layers
The CS method
The CS method for laminar boundary layers
The CS method for turbulent boundary layers

CHEE 1986

Boundary shape and roughness effects on streamflow

1 Theory, experimental, simple, compound, smooth, rough

2 To describe a method of calculating river flows with compound cross sections and multiple roughness without recourse to the use of a common energy gradient

3 Exponent determined for various cross sectional boundary shapes. Good agreement between theoretical computation of flow and laboratory research. Suggested that the range of cross sectional shapes, roughnesses, and discharges should be extended and confirmed using prototypical data.

4 Miniature current meter, electro magnetic current meter.

CHIU, CHIOU 1986

Structure of 3-D flow in rectangular open channels

1 Theoretical, experimental, simple, smooth, rough

2 To present a method that does not require velocity data in estimating the model parameters of primary flow, secondary flow, 3-D velocity distribution, and 3-D shear distribution. The interaction among the primary and secondary flows and the shear stress distribution was investigated under various values of Mannings n, aspect ratio and slope of channel.

3 Point of maximum velocity dips below water surface for smaller aspect ratio channels, particularly smooth channels. Similarly this feature occurs as channel slope is increased. By relating a velocity distribution coefficient to flow depth the characteristic of the isovels for channels of varying aspect ratio are determined. Patterns of secondary flow vary little with slope, however distribution varies across the section. Strength of secondary flow more uniformly distributed with increase in slope. Pattern of shear stress distribution affected by Mannings n and aspect ratio.

4 -

CHIU, HSIUNG, LIN 1978

Three dimensional open channel flow

1 Simple, rough, theoretical, prototype

2 Theoretical computation of secondary flow and comparison with prototype data using the curvilinear coordinate system formed by the isovels

3 Predictive program for secondary flow developed and verified with prototype and experimental data

4 -

CHIU, HSUING 1981

Secondary flow, shear stress and sediment transport

1 Theoretical, experimental, prototype, simple, rough

2 To study the relationship and interaction between secondary flow, shear stress and sediment concentration in alluvial channels

3 Formula developed to calculate shear stress in the flow and along the bottom and side walls of alluvial channels. Formula is a polynomial of the 2nd order with coefficients determined from a basic hydrodynamic equation and boundary conditions of both secondary flow and shear stress. No shear data required, formula capable of including effects of gravity, primary and secondary flows, and non uniformity of flow. Shear formula gives peak values of boundary shear on the channel bottom near the corner or side walls and also on the side walls between the channel bottom and the water surface.

4 -

CHIU, LIN, MIZUMURA 1976

Simulation of hydraulic processes in open channels

1 Simple, rough, theoretical, prototype

2 Determination of the three dimensional distribution of flow velocity, calculation of unsteady and steady flows in irregular channels, determination of resistance coefficients, calculation of secondary currents, calculation of unsteady dispersion in irregular channels, modelling and simulation of irregular channels

3 Predictive program developed using the curvilinear coordinate system as its basis

4 -

CHIU, LIN 1982

Computation of 3D flow and shear in open channels

1 Simple, smooth, theoretical, experimental, bend

2 A computational model to simulate primary flow velocity patterns which are then used as a coordinate system to develop equations to compute shear stress and secondary flow patterns

3 Good simulation of shear stress and primary flow velocity pattern but discrepancy in computation of secondary velocities

4 Preston tube

CHOUDARY, NARASIMHAN 1977

Flow in 180 degree open channel rigid boundary bends

1 Simple, smooth, experimental, bend

2 To study the conveyance, bed and wall shear stress at a bend

3 Details shear pattern and spiral flow pattern

4 Preston tube, pitot tube, point gauge

CLAUSER 1954

Turbulent boundary layers in adverse pressure gradients

1 Experimental, smooth, simple, duct

2 Experimental study of turbulent boundary layers in adverse pressure gradients. A comparison is made between the results and conventional methods of predicting the effect of pressure gradients on turbulent boundary layers.

3 Results compared with the method of analysis proposed by von Doenhoff and Tetervin. In respect of skin friction von Doenhoff uses a power law variation with Reynolds number and assumes that there is no effect of pressure gradient. Clauser results indicate that the pressure gradient effect is large. Based on results and analysis, need exhibited for reliable method of predicting the behaviour of turbulent layers under the influence of pressure gradients.

4 Pitot tube, hot wire anemometer

COLEBROOK 1939

Turbulent flow in pipes, with particular reference to the transition region between the smooth and rough pipe laws

1 Experimental, pipe, rough

2 Correspondence on turbulent flow in pipes with reference to friction factors; contributions by Blench, Chatley, Essex, Finniecome, Lacey, McDonald, Williamson

3 Advantage of exponential flow formula is its dynamical derivation and freedom from theory of velocity distribution;use of de Chezy formula with tabulated coefficients simplifies calculation;close agreement between work based on theory of dimensions and work investigating relationship between Chezy and Reynolds numbers;friction loss was dependent upon Reynolds number and roughness factor;pipe flow formulae need modification before application to open channels;alternate approximate formula for transition conditions proposed;Nikuradse`s work should not be applied outside range of existing experimental work

4 -

COLEBROOK, WHITE 1937

Experiments with fluid friction in roughened pipes

1 Experimental, pipe, rough, air

2 To determine how the nature of roughness affects the transition from smooth to rough law resistance

3 Uniform fine sand is indistinguishable from smooth conditions for Re = 6000, with increasing velocity transition begins and is complete by 100,000. Adding a few large grains ie 2% cover markedly increases resistance especially at low speeds. Transition is gradual. Increasing the % of large grain cover increases the effect on resistance

4 Pressure tappings, nozzle meter

COLES, HIRST 1968

Computation of turbulent boundary layers

1 Experimental, simple, duct, smooth

2 To assess the present and potential value of various methods for calculating the development of the turbulent boundary layer in a pressure gradient

3 Typical boundary layer flow can be viewed as a wake like structure which is constrained by a wall. Most important property of the law of the wall is that it provides a quite plausible method for estimating surface friction. Most important property of the law of the wake is that it avoids a direct confrontation with the physical mechanism of shear turbulence. Important to work at high Reynolds numbers. The final wake seems to evolve smoothly from the hypothetical wake profile associated with the boundary layer flow, rather from the boundary layer profile itself

4 -

CRUFF 1965

Cross channel transfer of linear momentum in smooth rectangular channels

1 Simple, smooth, rectangular

2 To investigate the lateral transfer of momentum from the central region to the vertical walls in smooth rectangular channels using shear stress as the governing parameter

3 Depth/width ratio of channel cross section only character that affects boundary shear stress. For small ratios bed shear predominates, this feature reducing for larger depth/width ratios

4 Pitot tube, piezometric tappings, point gauges, orifice meter, venturi meter

DAS, TOWNSEND 1981

Shear stress distribution at channel constrictions

1 Experimental, simple, smooth

2 An analysis of the curvilinear, accelerating and decelerating flow through a constriction and its comparison with flow through a bend

3 Velocity distribution is highly non uniform. Maximum longitudinal velocity filament is attached to the constriction face and is curvilinear. Nominal increase in mean velocity through the gap and against the upstream face of the constriction in comparison to the unrestricted channel velocity. Shear maxima in the contraction and at the upstream face of the contraction may reach many times the uniform bed shear stress in the unconstricted reach. Locus of the shear stress maxima follows closely the maximum velocity filament. Shear maxima increases exponentially with contraction ratio.

4 Miniature current meter, point gauge, electronic bed probe

DAVIDIAN, CAHAL 1963

Distribution of shear in rectangular channels

1 Experimental, simple, smooth

2 To determine the distribution patterns of boundary shear

3 With increasing Froude number the ratio of the maximum wall shear to the average wall shear stress decreases towards unity;the ratio of the average floor shear to the average total cross sectional shear decreases towards unity;the ratio of the average wall shear to the average floor shear increases towards unity. These features also occur with a shift in aspect ratio toward two dimensional flow.

4 Preston tube

DAVIES, WHITE 1928

An experimental study of the flow of water in pipes of rectangular section

1 Experimental, smooth, pipe

2 To study the range over which viscous flow equations could be applied to the flow of fluids in small clearances

3 Reynold`s numbers from 60 to 4600 investigated. Below 140 eddies not transmitted along the pipe. Pipe length required for eddy dissolution identified for Reynold`s numbers of 140 to 900. For turbulent flow, resistance coefficient values are the same as those for smooth circular pipes provided hydraulic mean depth is used. Roughness constituting 2% of the flow depth has no effect on resistance offered to viscous flow nor on that of turbulent flow

4 Volumetric tank, pressure tapping, thermometer

DAVIES, WHITE 1929

A review of flow in pipes and channels

1 Experimental, theory, simple, smooth, rough

2/3 To summarise the early studies of pipe and channel flow, to attempt to explain the aims and results of the experimental work and to indicate the direction needed for future work.

4 -

DELLEUR, TOEBES, UDEOZO 1967

Uniform flow in idealized channel floodplain geometries

1 Compound, smooth, rough, experimental

2 To investigate the interaction of main channel/floodplain flows for varying ratios of channel to floodplain width ratios

3 For wide floodplains relative to channel little flow interaction, flow interference increasing as the floodplain width reduces in width relative to the channel

4 Pitot tube, pressure transducer, point gauge

DELLEUR 1957

The boundary layer development in open channels

1 Simple, smooth, theoretical, experimental

2 Theoretical analysis of boundary layer development and its comparison with experimental results

3 Experimental results show presence of secondary currents at interface of the boundary layer and main flow. Theory does not take account of this phenomena but gives an average representation of the boundary layer development

4 Pitot tube

DEMUREN, RODI 1984

Calculation of turbulence driven secondary motion in non circular ducts

1 Theoretical, experimental, smooth, duct

2 Review of experiments on and calculation methods for flow in straight non circular ducts involving turbulence driven secondary motion. Discussion on the origin of secondary motion and shortcomings of existing calculation methods

3 Experimental review shows that in streamwise vorticity equation the terms involving the separation between the turbulent normal stresses and the shear stress are of the same magnitude and of the opposite sign. Difference of the two values provides driving energy for secondary motion and is of a similar order of magnitude to the convective term

4 -

DRAIN 1980

The Laser Doppler technique

Contains chapters on:

Introduction to Laser Doppler Anemometry
Optics and Lasers
The Doppler shift
Optical beating and the Reference Beam technique
The Differential Doppler technique

Signal Processing technique
Directional Discrimination and Frequency Shifting
Properties of Scattering
Applications

DURST, LAUNDER, SCHMIDT, WHITELAW 1977

Turbulent shear flows
Selected papers from 1st International symposium on turbulent shear flows
Comprising chapters on:

Free flows
Wall flows
Recirculating flows
Developments in Reynolds stress closures
New directions in modeling

DURST, MELLING, WHITELAW 1976

Principles and practice of laser doppler anemometry

Contains chapters on:

Principles of optics
Scattering phenomena and optical systems
Basic principles of laser doppler anemometry
Components of optical systems
Introduction to signal processing
Signal processing by frequency analysis
Signal processing by frequency tracking demodulation
Signal processing by counting
Scattering particles:specification
Scattering particles:generation and measurement
Laser doppler anemometers for specific requirements
Appraisal of laser doppler anemometry

DYNAMIC FLOW CONFERENCE PROCEEDINGS 1978

Dynamic measurements in unsteady flows

Contains chapters on:

Probes for multivariant flow characteristics
Measurements in intermittent and periodic flow
Measurements in two phase flow
Transducer techniques
Special problems
Signal and data processing
Multichannel measurements and high order statistics

EINSTEIN, BANKS 1950

Fluid resistance of composite roughness

1 Simple, smooth, rough, experimental

2 To determine the composite resistance of differing types of roughness in an open channel

3 Total resistance can be expressed as the sum of individual resistances so long as the different resistances do not mutually interfere

4 Point gauge, orifice

EINSTEIN, BARBAROSSA 1952

River channel roughness

1 Simple, compound, rough, prototype

2 Rational approach to the problem of determining the friction loss in natural streams. Existing theory is reviewed

3 Derivation of formulas and charts to determine relationship between stage and discharge. Interdependent treatment of flow and sediment characteristics. Friction losses due to grain roughness and channel irregularities are formulated. Suggestions for practical application of proposed method of friction evaluation are made

4 -

EINSTEIN, HARDER 1954

Velocity distribution and the boundary layer at channel bends

1 Simple, smooth, rough, bend, theoretical, experimental

2 To develop a theory to predict the cross distribution of flow velocities in rivers

3 Cross distribution of flow velocities is dependent upon the width/depth ratio

4 Floats

EINSTEIN, LI 1958

Secondary currents in straight channels

1 Simple, smooth, theoretical

2 To study the existence of straight uniform flows without secondary flows

3 Laminar flows without secondary flows are shown to be feasible, whilst the spontaneous formation of secondary currents in turbulent flow is exemplified

4 -

ELLIS, JOUBERT 1974

Turbulent shear flow in a curved duct

1 Simple, smooth, experimental

2 Investigate turbulent boundary layer in curved channels and compare with boundary layer development in straight channels

3 Non uniformity of turbulence development in a bend, turbulence suppressed on inside of bend, amplified on outside of bend

4 Pressure tappings, total head probe, Clauser chart

ELSAWY, CRORY 1978

Effects of interaction on a channel with one floodplain

1 Experimental, compound, smooth, rough

2 To measure shear stress under both interacting and isolated conditions in order to reveal the extent of energy transfer from the main channel to the floodplain, and the consequent effects on boundary shear distributions. To also investigate the effect of the interaction mechanism on friction and velocity in the channel and the floodplain.

3 Experiments demonstrate that the momentum transfer mechanism plays a large part in raising the velocities on the floodplain while lowering the velocities in the main channel. Shear measurements show the interaction phenomenon on the shear distribution on the river model perimeter.

4 Preston tube

ELSAWY, McKEE, McKEOGH 1983

Application of LDA techniques to velocity and turbulence measurements in open channel of compound section

1 Compound, smooth, experimental

2 To study interaction of channel and floodplain flows for varying geometries

3 LDA more appropriate to measurement of velocity and turbulence in compound channels than visual or thermal methods. Two component LDA required to enable measurement of Reynolds shear. Velocity gradient and turbulence intensity dependent upon channel/floodplain depth and channel/floodplain width ratios. Transfer of momentum due to flow interaction evident, transfer increased with increase of turbulence longitudinal component

4 One component Laser Doppler Anemometer

ENGELUND 1975

Instability of flow in a curved alluvial channel

1 Simple, rough, theoretical, experimental, annulus

2 To determine process of formation of bed topography by interaction of flow and sediment motion;bed instability and its contribution to scour hole formation

3 Prediction of bed forms associated with shallow depths accurate, less so for greater depths, inaccuracy possibly due to greater wall influence

4 Point gauge

ENGELUND 1974

Flow and bed topography in channel bends

1 Simple, rough, theoretical, experimental, bend

2 To account for the theory of helical flow in circular bends

3 Flow in bends predicted by balancing centrifugal force with pressure gradient. Neglects effect of friction and transverse velocity variation, good shear distribution correlation

4 Simple, rough, theoretical, experimental, bend

ERVINE, BAIRD 1982

Rating curves for rivers with overbank flow

1 Simple, compound, smooth, theoretical, experimental

2 To develop formulae for predicting discharge in compound channels

3 Formulae developed using experimental data from MYERS, RAJARATNAM and AHMADI, GHOSH and JENA, SELLIN.

Not applied to roughened channels

4 -

EUROMECH 130, 1980

Turbulent diffusion and dispersion in open channel flow

Papers and abstracts

EUROMECH 156, 1982

Mechanics of sediment transport

Sections on:

Flow structure as related to sediment transport
Single particle dynamics
Initiation, formation and behaviour of ripples and dunes
Transport of sediment in suspension
Sediment transport in steep channels
Other sediment transport problems

FARBER 1985

Determination of turbulence parameters in open channel flow using a Laser Doppler Anemometer and a Pitot tube

1 Experimental, simple, smooth

2 To compare differences in output from LDA and Pitot tube when measuring turbulence parameters in open channel flow

3 Differences expressed in plots of autocovariance functions of velocities, time scales and spectra of turbulence. Measurements made simultaneously to investigate correlations between pressure and velocity signals. Plots of crosscorrelation functions at different distances of probes show the connection between dynamic pressure and velocity fluctuations. From cross correlations information about eddy structure are gathered.

4 One component Laser Doppler Anemometer, Pitot tube

FIRTH 1979

An interpretation of rough surface heat transfer using roughness parameters

1 Theoretical, experimental, rough, duct

2 To present a study of the use of roughness parameters to interpret rough surface data

3 Interpretation of transverse ribbed roughness data using roughness parameters presented. Method given for interpolating values of momentum roughness parameter, for rib pitch, width, height ratios greater than 4, using drag coefficients. The effect of coolant property variation on the roughness parameter assessed for rib pitch, height ratios less than 20. Theoretical method for correlating the heat transfer parameter incorporating an empirical value related to the reduction in diffusivity between the ribs compared to in the bulk flow.

4 -

FIRTH, MEYER 1983

A comparison of the heat transfer and friction factor performance of four different types of artificially roughened surface.

1 Experimental, rough, duct

2 To compare the performance characteristics in terms of heat transfer performance and increased friction factor of four roughened surfaces which have the form of regularly spaced ribs or studs which act as turbulence promoters.

3 There is no advantage in using a transverse trapezoidal roughness. If a roughness is required with a low friction factor but without a reduction in rib height then best alternative is a helically ribbed surface. Best overall thermal performance is given by a three dimensional surface. The square transverse ribbed surface performs as well as other surfaces considered. The helically ribbed surface has a thermal performance comparable to the square ribbed surface;the high radial diffusivity of this surface and the presence of strong secondary flow induced give this surface an advantage over the square ribbed surface.

4 -

FLOKSTRA 1976

Generation of two dimensional horizontal secondary currents

1 Theoretical, experimental

2 To investigate the possibility of calculating two dimensional horizontal steady mean flow patterns using data from experimental investigations

3 Effective stresses must be considered in momentum equations to predict fluid patterns where secondary flow is anticipated. Smoothing procedure to suppress non linear instability may introduce closure

terms concerning effective stresses. Convection and turbulence most important contributors to effective stresses. Turbulence transfers energy to secondary currents. Convection transfers energy out of secondary flow. In respect of vorticity the non slip boundary conditions must be used.

4 -

FLOOD 1981

Distribution, morphology, and origin of sedimentary furrows in cohesive sediments, Southampton Water.

1 Prototype, experimental, simple, rough

2 To study the sedimentary furrows developed in the cohesive estuarine sediments

3 Observations of bedform morphology and current flow patterns are consistent with furrow initiation by large scale secondary circulation within the bottom boundary layer.

4 Sonar, echo sounders, current meters, salinity meter, thermometer.

FRANCIS, ASFARI 1971

Velocity distributions in wide curved open channel flows

1 Experimental, theoretical, smooth, bend

2 Experimental investigation of secondary currents in sharp bends of wide streams

3 Computational procedure a partial success;discrepancies due to channel cross section grid being coarse, cross sections too widely spaced, kinematic eddy viscosity derived on assumption that radial and vertical velocity components are zero, redistribution of tangential velocity due to turbulence effects being unaccounted for by assumed eddy viscosity profile

4 Miniature current meter

FRANZ 1982

Minimum specific energy in compound open channel

Discussion on paper by Blalock, Sturm 1981

FUKUOKA, KIM, EGUCHI 1986

Structures of the mean flow in meandering channels with asymmetric continuous bends

1 Experimental, theoretical, simple, smooth, bend

2 To investigate the flow characteristics of an asymmetric meandering channel, considered to be representative of natural rivers

3 In a weakly curved bend, the maximum velocity always occurs near the inner bank;in a strongly curved bank near the inner bank and centreline in the first half of the bend, and near the centreline at the end of the bend. The secondary flow in the weakly curved bend does not develop fully, whilst the secondary flow in the strongly curved bend develops throughout the cross-section. The lateral profile of the depth averaged velocity is mainly formed under the effect of the longitudinal pressure gradient and the transport of high or low momentum fluids caused by the secondary flow. The order estimation of the equations of motion to the asymmetric meandering flow is made on the basis of measured hydraulic quantities.

4 Pitot tube

FUTIAN 1986

The turbulent structure of channel flow with suspended sediment

1 Experimental, theory, simple, smooth, rough

2 Turbulent characteristics of sediment laden flow are presented on the basis of experiments in a perspex flume.

3 Experimental data indicate that the von Karman constant is diminished as the concentration of the sediment is increased along with an associated increase in turbulence intensity.

4 Laser Doppler Velocimeter

GADDINI, MORGANTI 1982

Turbulent shear stresses and velocity distribution in open channel flow

1 Simple, smooth, theoretical, experimental

2 To analyse turbulent shear stresses and identify lines of zero shear in a rectangular channel

3 Zero shear stress lines in the axial direction are orthogonals to the isovels. Velocity profile along lines of zero shear are logarithmic in profile

4 Hot film anemometer

GERARD 1977

Momentum transfer model for Reynolds stresses

1 Theoretical

2 Development of a phenomenological model assuming turbulence is composed of convected turbulence generated near the viscous sub layer and turbulent fluctuations formed by the interaction of mean stream velocity with the sub layer turbulence

3 Simple alternative to traditional derivation of momentum transfer for turbulence Reynold stresses presented

4 -

GERARD 1978

Secondary flow in noncircular conduits

1 Duct, smooth, theoretical, experimental

2 To show that the momentum transfer relationship links Reynolds stress and secondary flow

3 Reynolds stress at any point is a resultant of background turbulence not related to local mean velocity gradients and the momentum transfer related to the local mean velocity gradient

4 -

GERARD, BAINES 1977

Turbulent flow in very noncircular conduit

1 Experimental, duct, smooth

2 To study the velocity and boundary shear distributions in a very non-circular conduit

3 Wide disparity between form factor and hence friction factor of conduit and that of a pipe. Difference attributed to secondary flow effects. Length required for fully developed flow to occur represented by diameter of the exscribed circle rather than the hydraulic depth. Measured velocities indicate that the law of the wall is valid over a large portion of the cross section. Effect of the secondary flows was to depress the boundary shear distribution near the side centre. Secondary flow causes a 21% decrease in maximum boundary shear and 10% decrease in the average velocity. Average secondary flow magnitude was 0.7% of the maximum streamwise velocity.

4 Preston tube, pressure tappings, pitot tube

GESSNER 1973

The origin of secondary flow in turbulent flow along a corner

1 Duct, smooth, theoretical, experimental

2 To examine the mechanisms that initiate secondary flow in developing turbulent flow along a corner

3 The Reynolds stresses which affect the shear characteristics of primary flow are directly responsible for the generation of secondary flow in turbulent flow along a corner

4 Hot wire anemometer, pressure tappings, micromanometer

GESSNER, EMERY 1976

A Reynolds stress model for turbulent corner flows - Part 1:Development of the model

1 Theory, experimental, simple, compound, duct

2 A Reynolds stress model is proposed for modelling the local turbulence structure in flow along a streamwise corner.

3 An algebraic Reynolds stress model is developed by operating on a modified form of the Reynolds stress transport equations.

4 -

GESSNER, PO 1976

A Reynolds stress model for turbulent corner flows - Part 2:Comparisons between theory and experiment.

1 Experimental, simple, smooth, duct

2 To investigate the applicability of the Reynolds stress model developed for fully developed rectangular duct flow.

3 Model developed in which each component of the Reynolds stress tensor is related to components of the primary mean rate of strain. When coupled with the equations of motion the model can be used to analyse incompressible flow along a streamwise corner. A mixing length model, including a damping factor, representative of the observed mixing length behaviour in the near wall region for two dimensional duct flows is proposed.

4 -

GESSNER, EMERY 1981

The numerical prediction of developing turbulent flow in rectangular ducts

1 Experimental, theoretical, simple, smooth, duct

2 To develop a three dimensional length scale model to predict complex turbulent flows using experimental data.

3 Model offers a viable alternative to partial and full Reynolds stress transport equation models with respect to the prediction of the developing mean flow structure in a square duct and certain aspects of the local turbulence structure. The model can also be applied to predict local heat transfer behaviour within a square duct for both symmetric and asymmetric heating conditions at the wall. The primary flow structure in a square duct can be predicted using a relatively coarse grid. Axial mean velocity profiles, friction factor behaviour and local wall shear stress distributions are predicted accurately based on experimental data. Secondary flows are predicted well within the corner region but underestimated in the vicinity of the wall bisector.

4 Piezometric tappings, Kiel tube, Preston tube, Hot wire anemometer

GESSNER, JONES 1965

On some aspects of fully developed turbulent flow in rectangular channels

1 Duct, smooth, experimental, theoretical

2 Secondary flow characteristics in square and rectangular channels. Effect of Reynolds shear on secondary flow;directional characteristics of local wall shear stress;Reynolds stress planes normal to axial flow;Reynolds equation for secondary flow streamline

3 Non dimensional secondary flow velocities decrease with increasing Reynolds no.;skewness of local wall shear stress occurs in the vicinity of corners; in planes normal to the axial flow direction Reynolds stresses are not normal to the isovels;in planes normal to the axial flow direction opposing forces are exerted by the Reynolds stresses and static pressure gradient so producing secondary flow

4 Hot wire anemometer, pitot tube, pressure tappings

GHOSH 1972

Boundary shear distribution in channels with varying wall roughness

1 Simple, rough, experimental

2 Study boundary shear distribution in channel with laterally varying roughness

3 Shear distribution is non uniform in character. Computation of mean shear from velocity profile, energy gradient and direct measurement agree favourably

4 Preston tube, pitot tube, drag balance, V notch, manometer

GHOSH 1972

Boundary shear distribution in channels with varying wall roughness
Discussion by KNIGHT

GHOSH 1972

Boundary shear distribution in a rough compound channel
Synopsis

GHOSH, JENA 1971

Boundary shear distribution in open channel compound

1 Compound, smooth, rough, experimental

2 To investigate boundary shear distribution in smooth and artificially roughened channels

3 Shear distribution is non uniform with total drag force being related to flow depth and roughness concentration

4 Preston tube, pitot tube, volumetric tank

GHOSH, KAR 1975

River floodplain interaction and distribution of boundary shear stress in a meander channel with floodplain

1 Compound, smooth, rough, meander, experimental

2 To evaluate the interaction effect and distribution of boundary shear stress in a meander channel with floodplain

3 River/total discharge is a function of the channel/floodplain width ratio; interaction loss is related to floodplain depth with channel geometry and roughness distribution having less influence as one moves onto the floodplain.

2 Investigation of flow in steeply sloping rough channels.

3 For roughness coefficient n and index m , m = f(n) for every kind of roughness and flow state P.

4 -

GOSMAN, RAPLEY 1980

Fully developed flow in passages of arbitrary cross section

Chapter from Recent Advances in Numerical Methods of Fluids

Details: Experimental evidence
Mathematical description - equations of mean motion
heat transfer
equations for turbulent stress
stress transport models
algebraic stress models
other stress models
near wall region
heat transfer

Numerical analysis
Applications

GOTTLIEB, 1976

Three dimensional flow pattern and bed topography in meandering channels

1 Theoretical, experimental, rough, simple

2 To investigate flow pattern and bed topography in meandering channel by theoretical and experimental methods

3 Theoretical analysis based on three dimensional flow equations and a sediment conservation equation set up in curvilinear but orthogonal coordinates. Theory checked against measured secondary velocities and bed configuration, reasonable agreement considering model simplicity.

4 Miniature current meter, Velocity vector probe.

GOTZ 1980

Secondary flow and shear stress at river bends

Discussion of paper by Bathurst, Thorne and Hey

Remarks on measuring techniques, results of measurement, theoretical aspects and conclusions

GRASS 1971

Structural features of turbulent flow over smooth and rough boundaries

1 Experimental, simple, smooth, rough

2 To study boundary layer turbulence in a free surface channel flow

3 Instantaneous longitudinal and vertical velocity profiles allowed distribution of instantaneous Reynolds stress to be computed. Fluid ejection and inrush phases at boundary identified and correlated with Reynolds stress and turbulence production at the boundary

4 Hydrogen bubble technique, camera

GRIJSEN, MEIJER 1980

On the modelling of flood flow in large river systems with flood plains

1 Theoretical, compound, rough, prototype

2 Resume of mathematical model developed to model large networks of channels, floodplains, structures etc.

3 Applied to Parana and Paraguay rivers. Model elements; one dimensional model, channel reaches identified by name and coordinate, junctions between reaches, cross sections interpolated if not given where required, boundary conditions.

4 -

HAALAND 1983

Simple and explicit formulas for the friction factor in turbulent pipe flow

1 Theory, smooth, rough, pipe

2/3 Explicit, but accurate formulas for the friction factor are given as a substitute for the more inconvenient implicit formulas which are at present considered to be the most accurate.

4 -

HADRYS; NOUTSOPOULOS, CHRISTODOULOU; PRINOS, TOWNSEND; YEN, HO 1985

Floodplain and main channel flow interaction (KNIGHT, DEMETRIOU 1983)
Discussion

1 Compound, smooth, experimental

2/3 Incorrect assessment of main channel shear force; questioning of empirical equations as considered they overestimate shear; measurement of boundary shear and local velocities using min current meter questioned; suggest zero shear line should be used to define flow zones

4 -

HARTNETT, KOH, McCOMAS 1962

A comparison of predicted and measured friction factors for turbulent flow through rectangular ducts

1 Theoretical, experimental, simple, smooth, duct

2 To study analytically and experimentally the friction coefficient for both laminar and turbulent flow through rectangular channels

3 The analytic expression for the pressure loss in fully established laminar flow was verified by experiment. The Deissler and Taylor method of calculating the friction coefficient, which assumes that the universal velocity and temperature profiles found for fluids flowing turbulently in circular tubes is also valid for flow through non circular passages, was used. Calculated and measured results agreed for ducts with large aspect ratios. For aspect ratios less than 5:1, predicted friction factors were lower than those from the experimental data.

4 Piezometric tappings

HEAD 1976

Eddy viscosity in turbulent boundary layers

1 Theory, experimental

2 To observe variations of eddy viscosity in the outer regions of turbulent boundary layers.

3 Eddy viscosity is constant in any given equilibrium layer; eddy viscosity decreases in non equilibrium layers approaching separation; eddy viscosity increases in an adverse pressure gradient equilibrium layer when the pressure gradient is removed; eddy viscosity decreases with lateral convergence and increases with divergence. Reynolds stress increases in layers approaching separation

van der HEGGE ZIJNEN 1948

Turbulence

Contains chapters on:

Definition of turbulence
Generation of turbulence
Stability of laminar flow
Intensity
Scale
Frequency
Non electrical measurements of turbulence
Isotropic and non isotropic turbulence
Transfer by non isotropic turbulence
Transfer by isotropic turbulence
Von Karman`s similarity hypothesis
Summary of theories on interchange
Turbulence and flames
Turbulent boundary layers
Boundary layers and aerofoils
Turbulent resistance and bodies
Turbulent fluid resistances in pipes
Sedimentation and emulsification
Turbulent heat transfer
Turbulence and periodic motion
Atmospheric turbulence
Turbulent ocean currents

HEGLY 1936

The flow of water in a channel of complex profile

1 Prototype, compound, smooth

2 To determine the distribution of flow velocity in a channel of complex profile

3 Measurements undertaken on three channels. Majority of conclusions absent due to missing page in photocopy. To determine segment discharge for a compound channel details need to incorporate fictitious boundaries at changes in channel boundary, identify mean hydraulic radius for segment and mean velocity in order to determine discharge. Found that position of maximum velocity in the models differed from position in the prototype, better agreement was found in the case of straight channels than with curved channels.

4 Pitot tube, miniature current meter

HERBICH, SHULITS 1964

Large scale roughness in open channel flow

1 Experimental, simple, rough

2 To examine the systematic relationship that exists between Manning's n, Froude no. and a quantitative parameter of the roughness pattern

3 Systematic relationship involves roughness pattern parameter that relates projected area of roughness element in direction of flow to horizontal area of channel. Roughness coefficient for open channels may be predicted for channels with symmetric and relatively random distribution of uniform and non uniform cubical roughness elements based upon roughness coefficient from symetrically arranged cubes. No scale effects exists between geometrically similar channels when Froudian similitude is applied.

4 Point gauge

4 Pitot tube, manometer

GHOSH, MEHTA 1974

Boundary shear distribution in a compound channel with varying roughness distribution

1 Compound, smooth, rough, experimental

2 To assess the boundary shear distribution associated with different combinations of bank and bed roughness

3 Shear distribution on boundary of rectangular and trapezoidal smooth compound channels for similar depth are comparable. Shear distribution for roughened channels show greater variation. Roughening the floodplain more than the channel increases the floodplain drag. However roughening the channel bed and floodplain transfers most of the drag to the channel

4 Preston tube, pitot tube, volumetric tank

GHOSH, MISRA 1977

The frequency distribution of boundary shear and effect of non uniformity on shear distribution in open channel flow resistance

1 Experimental, simple, compound, rough, smooth

2 To investigate boundary shear distribution in various channel shapes

3 Parameter evaluated to describe non uniformity in shear distribution in open channel resistance

4 -

GHOSH, ROY 1970

Boundary shear distribution in open channel flow

1 Simple, smooth, rough, experimental

2 To gain knowledge on boundary shear distribution

3 For smooth rectangular channels the estimated shear from velocity profiles agrees with the measured shear using the drag balance. Shear measured with a Preston tube varies from the directly measured shear, difference accounted for by relative positioning of total and static head tubes. Roughening of a rectangular channel causes a reduction in the upper wall shear. Trapezoidal channels show a marked reduction again in upper wall shear. Max. drag stress occurs toward the corner of the channel as for rectangular channels. Discrepancy in shear stress readings from velocity profiles, direct drag measurement and Preston tube

4 Preston tube, drag balance, V notch, manometer

GONCHAROV 1964

Dynamics of channel flow

The mechanism of a plane flow
The boundary layer of a turbulent flow
The kinematic structure of turbulent channel flow
Rectilinear flows with rectangular cross sections
Rectilinear river flows
Flow in a channel bend
Additional resistances to channel flow

The dynamics of flow in deformable channels

GORDIENKO, 1967

The influence of channel roughness and flow states on hydraulic resistances of turbulent flow.

1 Experimental, rough, simple, theory.

HEY 1986

River mechanics

1 Prototype, experimental, simple, compound, smooth, rough

2 To review recent research on river mechanics and to consider the application of these principles for river engineering practice

3 Degree and extent of channel response to river engineering works depends on the nature of the imposed change and the natural characteristics of the river

4 -

HINZE 1959

TURBULENCE - An introduction to its mechanism and theory

Comprises chapters on:

General introduction and concepts
Principles of methods and techniques in the measurement of turbulent flows
Isotropic turbulence
Nonisotropic turbulence
Transport processes in turbulent flows
Nonisotropic free turbulence
Nonisotropic wall turbulence

HOLLEY, ABRAHAM 1973

Field tests on transverse mixing in rivers

1 Simple, rough, prototype

2 To investigate mixing of non buoyant substances. Vertical uniformity is assumed. Only transverse and longitudinal velocity and concentrations are considered.

3 Transverse spreading varies due to channel geometry and velocity distribution. To calculate diffusion coefficients important to identify spreading due to transverse velocities from diffusive mechanisms. Long reach of river required to obtain average rate of diffusive mixing for a river. Effect of transverse velocities easy to identify in bends

4 Fluorometer

HOLLEY, ABRAHAM 1974

Laboratory studies on transverse mixing in rivers

1 Simple, rough, experimental

2 To investigate mixing under simulated stream conditions and mechanisms other than bed shear turbulence that contribute to transverse mixing

3 Used general change of moments method for calculating diffusion coefficients

4 Fluorometer

HOLLEY, KARELSE 1974

Model prototype comparisons for transverse mixing in rivers

1 Simple, experimental, prototype, rough

2 To investigate transverse mixing in distorted and undistorted scale river models and to compare results with prototype

3 Transverse mixing correctly reproduced in natural scale model, distorted model exaggerates the diffusion, error dependent on distortion ratio

4 Fluorometer

HOLLICK 1976

Boundary shear stress measurement by Preston tube

1 Pipe, rough, experimental

2 To attempt to gain more accurate shear stress measurements using a Preston tube on a rough boundary

3 Reduction in apparent scatter of mean stress by adding base plate

4 Preston tube

HOOKE 1974

Shear stress and sediment distribution in a meander bend

1 Experimental, simple, smooth, rough, meander

2 To test the hypothesis that at every point on the bed of a meandering channel, bed geometry is adjusted to provide precisely the shear stress necessary to transport the sediment load supplied to that point

3 Maximum shear stress is on the point bar in the upstream part of the bend. It crosses channel centreline in middle or downstream part of bend. Secondary currents increase in strength with increased discharge

4 Point gauge, static tubes, V notch, pressure transducer, Preston tube

HUFFMAN, BRADSHAW 1972

A note on von Karman`s constant in low Reynold`s number turbulent flows

1 Theoretical, experimental, simple, duct, smooth

2 To analyse existing data on low Reynolds number flows

3 Logarithmic velocity profile valid for a wide range of low Reynolds numbers if the dimensionless shear stress gradient in the inner layer is not much greater than 10(-3). Viscous sublayer more sensitive to external influences than the fully turbulent part of the inner layer. Velocity defect law does not hold in outer part of boundary layer at low Reynold`s numbers, due to viscous superlayer at interface separating turbulent and irrotational flow

4 -

HULSING, SMITH, COBB 1966

Velocity head coefficients in open channels

1 Prototype, simple, compound, smooth, rough

2 To study the velocity head coefficient in natural channels

3 Variation in horizontal velocity distribution has more effect on alpha, the velocity head coefficient, than does the variation in vertical velocity distribution. For channels without overbank flow a significant correlation is shown between alpha and channel roughness expressed as Manning`s n. For channels with overbank flow a rational method of estimating alpha based on Manning`s n and channel conveyance.

4 Current meter

HUMPHREY, WHITELAW, YEE 1981

Turbulent flow in a square duct with strong curvature

1 Experimental, duct, smooth, water

2 To investigate the steady, incompressible, isothermal, developing flow in a square section curved duct with smooth walls

3 Main effect of the bend is to induce strong cross stream motions which develop into a pair of counter rotating vortices in the longitudinal direction. Driving force is the centrifugal force/radial pressure gradient imbalance. Secondary motion reponsible for the cross stream convection of stresses. Secondary motion driven by normal stresses shown by bulging of the velocity contours toward the duct corners. Stress high toward the walls, diminishing toward the core of the flow. Consequence of the secondary motion is an interchange of turbulence energy between the inner and outer wall

4 Laser doppler anemometer

HUSSEIN, SMITH 1986

Flow and bed deviation angle in curved open channels

1 Theory, experimental, simple, rough, bend

2 To investigate the variation of velocities and shear stress in a vertical in a bend

3 For normal width/depth ratio curved channels primary velocity distribution in vertical modified by spiral motion such that maximum primary velocity occurs below water surface. Modified logarithmic law introduced to describe velocity in a vertical. Non linear distribution of primary turbulent shear stress assumed allowing turbulent eddy viscosity to be derived. Prediction of radial velocity distribution with varying width depth ratio agrees well with observed data.

4 -

HWANG, LAURSEN 1963

Shear measurement technique for rough surfaces

1 Pipe, smooth, rough, experimental

2 Investigation to relate dynamic pressure to wall shear as a function of Preston tube size and roughness element

3 Pressure shear ratio developed for rough boundaries

4 Preston tube

IKEDA 1975

On secondary flow and bed profile in alluvial curved open channel

1 Simple, rough, theoretical, experimental, bend

2 Investigate secondary flow in uniformly curved open channels; determine the stable bed profile equation

3 Bed profile is related to secondary flow at particle level ie determined by tractive force and channel roughness

4 Pitot tube

IKEDA 1981

Self formed straight channels in sandy beds

1 Experimental, theoretical, simple, rough

2 To study the process of widening and hydraulic characteristics of self formed straight channels with non cohesive sands in idealized circumstances. Secondary circulations are analysed theoretically

3 Corresponding to a combination of the hydraulic variables, a stable channel which allows bed load transport in the central bed region does exist. The transverse bed shapes in equilibrium have a universal shape in the side bank region regardless of the initial shape, discharge and sand diameter. Side bank region keeps shape also in widening process. Equilibrium depth and width depend not only on discharge but also on slope and bed materials. Secondary currents affect the local features of the self formed straight channels

4 Point gauge, pitot tube

IKEDA, TANAKA, CHIYODA 1984

Abstract

Turbulent flow in a sinuous air duct

1 Experimental, smooth, bend, duct

2 To investigate turbulent three dimensional flow to gain information on mean velocity components, Reynolds stresses, turbulent kinetic energy production and dissipation

3 Turbulent flow characteristics correlated with local pressure gradient. The k-e model predicts distribution of pressure, mean velocity and turbulence field.

4 Pitot tube

IMAMOTO, ISHIGAKI 1986

The three dimensional structure of turbulent shear flow in an open channel

1 Experimental, simple, smooth

2 To investigate the depth scale structure of turbulent shear flow in a straight open channel

3 Longitudinal vortices influence the distribution of the mean turbulence quantities. The production term and the dissipation term in the upwelling region of the vortices are larger than those in the downwelling region. The sweep event is dominant in the downwelling region, and in the upwelling region the ejection event is as same as the sweep event in magnitude.

4 Laser Doppler Velocimeter

INDLEKOFER, ROBINSON, ROUVE

On the transport of bed load into channel branches and the regulation by inducing artificial secondary flow

1 Experimental, theoretical, simple, rough

2 To study the interaction between bed load transport into branch channels of water off takes and the resultant spiral secondary flow.

3 Experimental observations lead to the definition of a dimensionless factor which offers a numerical expression of the strength of the spiral secondary flow at the channel branch. The influence of the water depth ratio and Froude no for the main channel and the width and dicharge ratios of the main and branch channels on the secondary flow is demonstrated. The spiral secondary flow influences the near bottom flow such that a superproportional part of the whole bed load will be transported into the branch channel.

4 Point gauges, bed load samplers

van INGEN 1981

Observations in a sediment laden flow by use of laser doppler velocimetry

1 Experimental, simple, rough

2 To study the mechanics of suspension and entrainment of sediment during transport by water using a laser doppler velocimeter

3 Identified need for long record length necessary to study fluid turbulence, problem of movement of mobile bed and its effect on meaning of measurements, problem of sampling conditional events and determination of the accuracy of the sampled event. Character of the interactions between the fluid turbulence and the motions of the individual sediment grains identified

4 Laser doppler velocimeter

INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH, 1967
12th CONGRESS - FORT COLLINS - VOLUME 1

Various papers on secondary flow and currents

Authors - CIRAY; CHIU; ANANIAN; MURAMOTO; CHIKWENDU; LEBRETON & NICOLLET; YEN; RAO & SEETHARAMIAH.

VOLUME 2

Various papers on macroturbulence in open channels

Authors - MASAIR; KEMP & GRASS; PECHENKIN; DELLEUR, TOEBES & LIU; MASA AKSOY; HARTUNG & CSALLNER; IWASA; PLATE; ISHIHARA; LOCHER & NAUDASCHER; POZNIAJA; HUNG; JEZDINSKY, CAKRT, RUDIS & SMUTEK; TIFFANY

IPPEN, DRINKER 1962

Boundary shear stresses in curved trapezoidal channels

1 Simple, smooth, experimental, bend

2 To investigate the distribution and magnitude of boundary shear stress in curved reaches of smooth trapezoidal channels

3 Shear stresses increased in intensity in curved reach c/f straight reach. Magnitude of shear maxima not predictable, possible to determine total head loss. Location of shear maxima not greatly modified for different channel alignments. Shear stress orientation is important in bank stability

4 Preston tube, pitot tube, point gauges, manometers

JAMES 1985

Sediment transfer to overbank sections

1 Compound, smooth, rough, theoretical, experimental

2 To simulate overbank transfer of suspended sediment

3 Model accounts for sediment transfer by convection and turbulence diffusion mechanisms. Secondary currents accounted for by transverse diffusion

4 -

JAMES, BROWN 1977

Geometric parameters that influence floodplain flow

1 Experimental, compound, smooth, rough

2 To establish stage discharge relationships for various channel floodplain configurations and if possible formulate computational procedure to account for apparent interaction between channel and floodplain. To determine parameters that describe increase in flow resistance that occurs when a channel crosses or meanders in a floodplain; also when channel meanders outside or separates from the floodplain.

3 Manning or Chezy equations do not accurately predict stage discharge relationship for shallow floodplain depths without adjustment to either resistance coefficient or the hydraulic radius. Empirical relationships correcting basic equations incorporating aspect and depth ratios have been developed.

4 Venturi meters, point gauge, pitot tube, transducer, camera

JOBSON, SAYRE 1970

Vertical transfer in open channel flow

1 Simple, rough, experimental

2 To investigate the vertical turbulent transfer of momentum, fluid mass, suspended sand particles and particle fall velocity in open channel shear flow

3 Turbulence increases fall velocity by 4% to 5%. Vertical mixing occurs due to diffusion by tangential components of turbulent velocity fluctuations and by diffusion due to centrifugal force associated with particle curved paths

4 Fluormeter, dye

JOHNSON 1942

The importance of considering side wall friction in bed load investigations

1 Theory, experimental, simple, smooth, rough

2 To investigate the influence of side walls on bed load transport and to study the effect of temperature and viscosity on sediment load.

3 Primary effect of temperature is in the effect of viscosity variations on the magnitude of the friction along the relatively smooth side walls. Treating the flow as two dimensional tends to reduce the influence of temperature on bed load transport.

4 -

JONES 1976

An improvement in the calculation of turbulent friction in rectangular ducts

1 Theory, experimental, simple, duct, pipe

2 To examine frictional pressure drop in rectangular ducts

3 At constant Reynolds numbers based on hydraulic diameter the friction factor increases monotonically with increasing aspect ratio. Concluded that hydraulic diameter is not the correct characteristic length to use in the Reynolds number to ensure similarity between between circular and rectangular ducts. The Reynolds number was modified so that geometric similarity was provided in laminar flow for all geometries such that this Reynolds number provided good similarity in fuuly developed turbulent flow. By using this laminar equivalent Reynolds number circular tube methods can be applied to rectangular ducts.

4 -

JONES, LEUNG 1981

An improvement in the calculation of turbulent friction in smooth concentric annuli

1 Theory, experimental, smooth, annuli

2 To describe the application of a laminar equivalent Reynolds number to turbulent flow in smooth concentric annuli

3 Circular tubes and concentric annuli are mathematically shown to be geometrically similar in laminar flow, and by data comparison to be similar in turbulent flow. The modified Reynolds number which provides the consistency for all geometries uses the laminar equivalent diameter given by the product of the hydraulic diameter and a shape function and applies uniformly for all radius ratios from 0 to 1. The modified Reynolds provides geometric equivalency between smooth circular tubes, smooth rectangular channels, and smooth concentric annuli for laminar and turbulent flow.

4 -

JONSSON 1974

Laser velocity meter for water flow

Paper comprising chapters on:

Velocity measurements in liquids
Review and objective of the study
Movement of small particles in a fluid
The photomultiplier
Doppler shift
Doppler shift at certain optical configurations
Directional sensitivity with optical heterodyning - reference beam
Directional sensitivity with optical heterodyning - double beam
Uncertainty in velocity determination due to uncertainty in propogation direction for the laser beam
Intensity distribution at focus for a Gaussian beam
Light scattering from small particles
Detected light intensity at the passage of a particle through two different light waves
Doppler signal in the frequency domain
Doppler signal when more than one scattering particle is present
Calculation of the size of the measurement point
Coherence
Refractive index variations
Spectral analysis of the Doppler signals
Continuous frequency determination methods
Measurement

JURISCH 1973

Instantaneous velocity measurements in hydraulic models by laser doppler enemometry. Paper deals with installation of a back scattering laser, discusses its principle of operation, its relative advantages and disadvantages, and its use in hydraulic practice

KALKWIJK, de VRIEND 1980

Computation of the flow in shallow river bends

1 Theoretical, experimental, rough, bend, simple

2 To develop a depth averaged computation procedure including the convective influence of secondary flow for large aspect ratio, shallow bend channels where flow is friction controlled, longitudinal velocities dominate and Froude no is low.

3 Steady flow in shallow rivers of moderate curvature described mathematically as long as covective influence of secondary flow taken into account.

4 -

KARASEV 1969

Influence of the banks and flood plain on channel conveyance

1 Theoretical, experimental, prototype, compound, rough

2 To investigate the influence and quantify the effect of the shape and dimensions of the cross section on conveyance.

3 The momentum equation, which allows for mass exchange at the lateral boundaries, permits an overall estimate of the influence of the banks and flood plain on conveyance. Empirical parameters relating to channels without flood plains and to channels with flood plains are included in the working relationships. These parameters to be refined in respect of the structure and characteristics of flow in subsequent investigations. In respect of flow from the channel to the flood plain and vice versa more investigation is required. The dynamic scheme, which allows for the mechanism of lateral mass exchange, has significant advantages over the correlative statistical relationships.

4 -

KARTHA, LEUTHEUSSER 1970

Distribution of tractive force in open channels

1 Simple, smooth, experimental

2 Investigation of tractive force distribution to allow comparison with analytically predicted shear stress distributions for varying aspect ratio

3 Measured values of maximum non dimensional shear stress are of similar magnitude to shear stress values computed from laminar theory or deduced turbulent channel flow analysis. Analytical techniques do not provide a detailed picture of shear distribution

4 Preston tube, pressure tappings, flowmeter, adj weir, point gauge, manometer

KAZEMIPOUR, APELT 1979

Shape effects on resistance to uniform flow in open channels

1 Simple, smooth, experimental, theoretical

2 Development of method to estimate influence of shape effect of cross section on flow resistance

3 Shape factor developed that accounts for non uniform distribution of shear stress and variation of aspect ratio

4 -

KAZEMIPOUR, APELT 1982

New data on shape effects in smooth rectangular channels

1 Simple, smooth, experimental, theoretical

2 To investigate method of refining factor which reflects effect of aspect ratio on resistance

3 Factor reflecting effect of aspect ratio on resistance little changed by refinement. Considered to indicate consistency of experimental data

4 Point gauges

KELLER, RODI 1984

Prediction of two dimensional flow characteristics in complex channel cross section

1 Theory, experimental, compound, smooth, rough

2 The application of a depth averaged numerical model to the prediction of interaction phenomena

3 The depth averaged form of the k-e turbulence model can be utilized to predict the effects of interaction phenomena on flow profiles in channel/flood plain flows. The model requires further testing with laboratory and field data.

4 -

KIKKAWA, IKEDA, KITAGAWA 1976

Flow and bed topography in curved open channels

1 Simple, smooth, rough, theoretical, experimental, bend

2 Theoretical examination of mean flow characteristics, bed shear distribution, bed profile change with time and maximum scour depth. Comparison with field and experimental data

3 Bed shear distribution and transverse distribution of mean velocity well represented by forced vortex theory. Velocity in vertical expressed by the velocity defect law

4 Pitot tube, weir, adj tailgate

KIM, KLINE, REYNOLDS 1971

The production of turbulence near a smooth wall in a turbulent boundary layer

1 Experimental, simple, smooth

2 To examine the structure of the flat plate incompressible smooth surface boundary layer in a low speed water flow

3 Turbulence occurs during bursts in the sublayer to log zone region. Bursting process comprised of three phases. Bursts caused by transfer of primary energy from mean flow velocity due to local intermittent instability which has a preferred range of frequency of occurrence and oscillation

4 Hot wire anemometry, hydrogen bubble technique

KINGHORN, McHUGH, DUNCAN 1973

An experimental comparison of two velocity area numerical integration techniques

1 Experimental, simple, smooth, pipe

2 To establish if fitting a series of cubic curves between successive pairs of local velocity measurements can be used as a satifactory alternative to the log linear method.

3 The method of cubics integration technique may be used in place of the log linear method but considerable extra computational effort is required.

4 Pitot tube

KIYEN 1968

Hydraulic computation of flood plain channels.

1 Theoretical, compound, rough.

2 Using method of separation of cross section of a water course into parts to try and analyse problem of hydraulic computation of flood plain channels.

3 The recommmended formulae for flow velocities in main channel and flood plain channel, with allowance for dimensionless coefficients Km and Kf, can be used for hydraulic computation of canals with a composite cross sectional profile and embanked channels.

4 -

KLAASSEN, Van Der ZWAARD 1973

Roughness coefficients of vegetated flood plains

1 Simple, experimental, rough.

2 Study on hydraulic resistance of hedges and fruit trees such as those in flood plain of the Maas.

3 The presence of vegetation such as hedges and fruit trees can affect the roughness of the flood plain. Roughness influenced by spacing of hedges, number of trees, water level over flood plain. Removal of vegetation results in lower water levels and smaller mean current velocities in the minor bed.

4 Point gauges, Ott-type current meter, pitot tube.

KLEIN 1981

Review: Turbulent developing pipe flow

1 Theory, experimental, smooth, rough, pipe

2 To review experimental results on turbulent developing pipe flow

3 Development of both the velocity profile and turbulence in turbulent pipe flow depends largely upon upstream flow history. Undisturbed entry flow generates a maximum in profile peakiness at about 40 pipe diameters. Certain initial disturbances produce smooth profile development without such maxima. Full flow development may require a distance of 140 pipe diameters. The beginning and termination of laminar turbulent transition is determined most reasonably from a plot of the blockage factor against Reynolds number defined with flow distance.

4 -

KNIGHT, MacDONALD 1979

Hydraulic resistance of artificial strip roughness

1 Simple, smooth, rough, experimental

2 Study of flow patterns over roughness elements, bed resistance factor variation and dependence of Nikuradse k on dimensionless parameters

3 Resistance coefficients determined for 2D flow over strip roughness for range of relative spacing and relative depths, classification of flow patterns for 2D flow; observation of stable circulatory motion in grooves at b/k of 2.5, agreeing with theory. Variation of resistance parameter considered more relevant than Nikuradse k for nonuniform roughness

4 Preston tube, min current meter, venturi, dall tube, manometer, pressure tappings

KNIGHT, MacDONALD 1979

Open channel flow with varying bed roughness

1 Simple, smooth, rough, experimental

2 To investigate the basic distributions of velocity and boundary shear stress in channels of simple cross section and roughness distribution

3 Mean wall/mean bed shear stress dependent on boundary roughness distribution and aspect ratio; % shear force carried by bed and walls varied with depth/breadth ratio and roughness. Channel can be considered wide, ie two dimensional flow exists when width/depth ratio is greater than 10. Transfer of linear momentum identified by reference to mean wall shear stress

4 Preston tube, min current meter, venturi, dall tube, manometer

KNIGHT, MacDONALD 1981

Open channel flow with varying bed roughness
Closure of paper presented in 1979

KNIGHT 1981

Boundary shear in smooth and rough channels

1 Simple, smooth, rough, experimental

2 Method for calculating mean wall shear and bed shear for range of breadth/depth ratios and range of differential roughness

3 Ability to determine %sf carried by wall; reduction of %sf on wall with increasing aspect ratio and bed/wall roughness ratio

4 Preston tube

KNIGHT, PATEL, DEMETRIOU, HAMED 1982

Boundary shear stress distributions in open channel and closed conduit flows

1 Simple, smooth, theoretical, experimental

2 To analyse secondary flow and contra rotating wall cells

3 Multi cellular secondary flows influence boundary shear distributions; proportion of total shear force acting on boundary walls varies with aspect ratio

4 -

KNIGHT, DEMETRIOU 1983

Floodplain and main channelflow interaction

1 Compound, smooth, experimental

2 To understand the general nature of the interaction between deep and shallow regions of flow

3 Apparent shear force acting on vertical interface between channel and floodplain strongly depth dependent. Apparent shear force always positive indicating floodplains retard channel flow. Apparent shear force on horizontal interface varies with floodplain/channel width ratio and relative depth

4 Preston tube, min current meter, venturi, point gauges, manometer

KNIGHT, DEMETRIOU 1986

Flood plain and main channel flow interaction
Closure

KNIGHT, DEMETRIOU, HAMED 1983

Hydraulic analysis of channels with floodplains

1 Compound, smooth, rough, experimental, theoretical

2 Investigation of velocity and boundary shear stress distributions in compound channels

3 Main/floodplain channel flow division influenced by momentum transfer from channel to floodplain. Floodplain shear force varies with channel/floodplain depth and roughness ratios. Apparent shear force at vertical interface as a % of total shear force for asymmetrical compound channel related to total shear force acting on floodplain. Apparent shear force at vertical interface varies with depth and floodplain roughness. Interface apparent shear greater for asymmetrical compound channel c/f symmetrical compound channel

4 Preston tube, min current meter

KNIGHT, DEMETRIOU, HAMED 1984

Stage discharge relationships for compound channels

1 Compound, smooth, rough, theoretical, experimental

2 Investigation into methods of determining stage discharge relationship for symmetrical compound channels

3 Dimensionless stage discharge relationship developed. Based on inclined interfaces between channel and floodplain(zero shear line?) as vertical interface does not account for momentum transfer

4 Preston tube, min current meter, adj weir

KNIGHT, DEMETRIOU, HAMED 1984

Boundary shear in smooth rectangular channels

1 Simple, smooth, experimental

2 To investigate boundary shear stress and boundary shear force distribution in smooth rectangular channels

3 % total shear force acting on walls reduces with increasing aspect ratio. Contra rotating secondary flow cells cause differences in boundary shear between channel flow and duct flow. Secondary flows account for difference in maximum and centreline bed shear stresses in low aspect ratio channels, also comparing smooth pipes with smooth rectangular channels at similair Reynolds no shows channel resistance to be higher due to secondary currents

4 Preston tube, min current meter

KNIGHT, HAMED 1984

Boundary shear in symmetrical compound channels

1 Compound, smooth, rough, experimental

2 To investigate the influence of roughness on boundary shear stress and boundary shear force distribution

3 Boundary shear forces are strongly dependent on depth and roughness ratios. % total shear force carried by floodplains varies systematically with floodplain/channel width and depth ratios. Vertical and lateral velocity distribution is strongly depth dependent; division of flow between channel and floodplain is clearly influenced by lateral transfer of momentum. Stage discharge relationship varies systematically with floodplain/channel and roughness ratios

4 Preston tube, min current meter

KNIGHT, PATEL 1985

Boundary shear in smooth rectangular ducts

1 Simple, smooth, experimental, duct

2 To investigate the boundary shear stresses in rectangular smooth ducts

3 The number and distribution of contra rotating secondary flow cells is correlated with aspect ratio. Difference in shear stress between ducts and open channels is put down to the presence of a free surface in open channel flow

4 Pitot tube, Preston tube, orifice, pressure tappings, manometer

KNIGHT, LAI 1985

Turbulent flow in compound channels and ducts

1 Compound, smooth, duct

2 Investigation of flow structures, velocities and boundary shear distributions in ducts of compound cross section

3 As depth decreases the zero shear interface between floodplain and channel reduces from an angle of 50 degrees to 3 degrees. Bed shear stresses are < floodplain shear at high depth and > floodplain shear at low depths

4 Pitot tube, Preston tube

KNIGHT, PATEL 1985

Boundary shear stress distributions in rectangular duct flow

1 Simple, smooth, duct

2 To investigate boundary shear stress distribution for varying aspect ratios

3 Perturbations in boundary shear due to multi cellular secondary flow patterns Perturbations controlled by aspect ratio

4 Preston tube, orifice, pressure tappings

KOLOSEUS, DAVIDIAN 1966

Free surface instability correlations

1 Experimental, simple, rough, smooth

2 To study the correlation that exists between the observable physical characteristics of flow which is classified as stable or unstable

3 Correlation between unstable flow and roll waves is fair. Roll waves decrease the maximum carrying capacity of a channel. Minimum distance required for the development of roll waves is a function of channel roughness, channel shape, depth of flow, degree of instability. For a given slope roll wave development distance increases with discharge. For a particular discharge the roll wave development distance decreases as the slope increases. Development distance decreases as channel roughness increases.

4 Electronic point gauge, piezometric tapping

KOLOSEUS, DAVIDIAN 1966

Roughness concentration effects on flow over hydrodynamically rough surfaces

1 Theoretical, experimental, simple, smooth, rough

2 To discuss the mechanics of stable uniform flow so as to obtain a better understanding of flow over rough boundaries

3 Ratio of the sum of upstream projected areas to the channel area is a satisfactory measure of roughness concentration. Relationship between resistance coefficient and roughness concentration, independent of roughness shape, exists over some range of concentration. Upper limit varies with roughness shape; upper limit decreases as length of body increases in direction of flow. Limiting concentration exists above which relation between resistance coefficient and concentration becomes more complex. Effective roughness increases with like changes in drag coefficient. No one concentration exists at which boundary resistance is greatest and no one concentration applicable to all forms of roughness at which interference effects are first noticeable

4 -

KOMATSU, KOTSUBO, UMENAGA 1986

Characteristics of large vortical structure in a mixing shear flow and its hydraulic roles

1 Experimental, simple, smooth

2 To investigate the hydraulic role of a large vortical structure in mixing shear flow

3 Unique relationship between the period of vortical structure and the reciprocal of maximum mean shear. Vortical structure lifetime is shortin a mixing shear flow with large Reynolds numbers. Large quantities of lower layer fluid is entrained into the mixing shear flow when the vortical structure is generated. Phase velocity of the frequency band which includes the vortical structure is distributed so as to make the averaged velocity gradient uniform. The assumption of Taylor`s frozen turbulence is not strictly satisfied in a mixing shear flow. The contributions of the vortical structures to the time spectra of the turbulent energies are small in the central region of the mixing shear flow but larger in the far regions from the centre. The contributions of the high frequencies are reversed. The co spectra indicate that the vortical structure contributes to the Reynolds stress

and density fluxes. The vortical structure transports momentum and mass vertically in the raising and descending flow part of the rotational motion.

4 Hot film anemometer

KOMORA 1973

Hydraulic resistance to flow in channels

1 Experimental, simple, rough

2 To determine the bed shear stress in rectangular and trapezoidal channels for uniform bed and wall roughness and for beds and walls of different roughness

3 For uniform bed and wall roughness bed shear dependent on aspect ratio

4 -

KOMORA 1976

Distribution of velocities and shear stress in open channels

1 Experimental, theory, simple, smooth, rough

2 To investigate velocity distribution in cross sections and shear stress distribution over the wetted perimeter.

3 Computational method developed for vertical velocity distribution if the channel base width is greater than twice the flow depth. Channels with uniform roughness on bed and walls show a dependence of shear stress upon relative channel width. If the channel width is ten times the depth then the shear stress is representative of an infinitely wide channel. Method devised for computing average shear stress in channels where bed is rougher than side walls. For trapezoidal channels with uniform roughness the average shear stress is dependent upon relative channel width. Channel shape does not significantly influence the

average shear stress value of the side walls. For smooth channels the shear stress on the bed is lower than that for rough channels.

4 -

KONEMANN 1980

The influence of interaction between floodplain and main channel on the resistance coefficient of open channels with compound cross sections

1 Experimental, compound, smooth, rough

2 Development of an approximation method for hydraulic computation of open channels with compound cross sections

3 Good agreement between approximation and measured data. Identifies discrepancy between approximation and conventional method

4 Min current meter, laser doppler anemometer, hot film anemometer, pitot tube

KONEMANN 1982

Minimum specific energy in compound open channel

Discussion of paper by Blalock, Sturm 1981

KOSORIN 1983

Turbulent shear stress and velocity distribution in vegetated zone of open channel

1 Simple, rough, theoretical, experimental

2 To investigate the drag properties of weed

3 In the weed zone the shear distribution is not linear and velocity profile is not logarithmic. Shear stress, velocity and Chezy are dependent upon density of vegetation, characteristic diameter of vegetation roughness and vegetation height. Mean cross section velocity is not depth dependent if weed height is the same as flow depth.

4 Min current meter, drag balance

KRADOLFER, 1983

Computation of discharge in channels of simple and compound cross section

1 Experimental, simple, compound, rough

2 Presentation of uniform steady flow formulae. Evaluation of uniform steady flow formulae for compound channels

3 Results from different calculation methods compared with laboratory test. Calculation method applied to natural river

4 -

KRAUSE 1969

Velocity distribution and energy dissipation in turbulent pipe and channel flow

1 Theoretical, experimental, smooth, rough, smooth

2 To investigate velocity distribution and energy dissipation in channels of perspex and channels roughened with tar paper and pyramidal roughening
elements

3 Comparison of results with previous research

4 -

KRISHNAPPEN, LAU 1986

Turbulence modeling of flood plain flows.

1 Theoretical, experimental, compound, smooth, rough.

2 Numerical model to calculate flow and shear stress distributions in channel with compound cross sections.

3 For specified boundary roughness, channel slope and flow depth model predicts total flow rate, shear stress distribution around wetted perimeter and velocity distribution, from which the division of flow and shear force between the main channel can be computed

4 -

KROGSTAD, FANNELOP 1983

Effect of roughness on three dimensional turbulent boundary layers.

1 Experimental, rough, smooth, theory.

2 A comparison of boundary layer data using scaling criteria developed from two dimensional flow. To determine whether increase in transverse friction or increase in streamwise friction(2 opposing effects) is dominant.

3 The results of 2 and 3 dimensional flows agree well in regions where pressure gradients are dominant cause of 3 dimensionality. In regions where shear stresses are more important, significant deviations in profile characteristics appear.

4 Impact probe, Preston tube, hot wire anenometer

KUIPERS, VREUGDENHIL 1973

Calculations of two dimensional horizontal flow

1 Theoretical, experimental

2 To investigate the possibilities and limitations of applying a computational method for non steady flow in two horizontal dimensions.

3 Two dimensional flow patterns including eddies and flow separation reproduced well. Convective acceleration terms important in respect of eddy generation. Effective stresses in vertical planes not clarified, not considered important.

4 -

KYOTO UNIVERSITY, DISASTER PREVENTION RESEARCH INSTITUTE
ABSTRACTS

IMAMOTO, KUGE

1974 Annual report no 17

On the basic characteristics of an open channel flow in complex cross section

IMAMOTO, ISHIGAKI, INADA

1982 Annual report no 25

On the hydraulics of an open channel flow in complex cross section

IMAMOTO, ISHIGAKI, FUJISAWA

1982 Annual report no 25

On the characteristics of open channel flow in bend with floodplains

IMAMOTO, ISHIGAKI

1983 Annual report no 26

Experimental study on the boundary shear stress distribution and longitudinal eddies in open channel flow

IMAMOTO, ISHIGAKI, KINOSHITA

1984 Annual report no 27

On the hydraulics of an open channel flow in complex cross section

IMAMOTO, ISHIGAKI

1984 vol 4, no 14

Boundary shear stress measurement using hydrogen bubble method in an open channel flow

LAMONT 1954

A review of pipe friction data and formulae, with a proposed set of exponential formulae based on the theory of roughness

1 Experimental, theory, pipe, rough

2 To summarize experimental records, compare them with the theory of roughness and exponential formulae of Hazen/Williams, Blair, Manning, Barnes and Scimemi. New exponential formulae proposed.

3 Theory of roughness provides most rational basis for the solution of pipe friction problems. Proposed exponential formulae provides method for solution of pipe friction problems over a very wide range of roughness and velocity

4 -

LANGBEIN, LEOPOLD 1966

River meanders Theory of minimum variance

1 Prototype, simple, rough, meander

2 To examine the planimetric shape of meanders and the variations in such hydraulic properties as depth, velocity, and slope in meanders as contrasted with straight reaches.

3 The geometry of a meander is that of a random walk whose most frequent form minimizes the sum of the squares of the changes in direction in each unit length. Changes in direction closely approximate a sine function of channel distance. Depth, velocity, and slope are adjusted so as to decrease the variance of shear and the friction factor in a meander over that in an otherwise comparable straight reach of the same river.

4 -

LANSFORD, MITCHELL 1948

An investigtion of the backwater profile for steady flow in prismatic channels

1 Experimental, simple, smooth

2 To obtain and make available surface profiles of the M1 type for steady flow in prismatic channels, also to provide data for studies on the inter-relationship of stage, slope and discharge

3 Reasons for differences in measured and computed readings suggested. Observations in respect of the point of maximum curvature of the backwater profile put forward.

4 Point gauges, current meters, pitot tube

LARSSON 1986

Coriolis generated secondary currents in channels

1 Theoretical, experimental, simple

2 To discuss the way in which flow in channels is affected by the Coriolis accelerations due to the rotating earth.

3 Theory enables an estimate to be made of the magnitude of the Coriolis induced secondary velocities for a particular channel at a certain downstream location. The results relate only to the horizontal component at the cross plane centre point. Considered this velocity is representative of the horizontal velocities in the whole cross section. For small aspect ratio channels the secondary horizontal and vertical velocities are of similar magnitude, the vertical component reducing with increasing aspect ratio. A channel has to be deep and slow flowing for the Coriolis effect to be important.

4 -

LAU, KRISHNAPPAN 1977

Transverse dispersion in rectangular channels

1 Simple, rough, experimental, theoretical

2 To investigate the variation of the transverse dispersion coefficient and its dependence on friction factor and aspect ratio

3 At constant velocity the transverse dispersion coefficient increased with increasing depth. If depth constant then turbulence structure was unchanged. Increasing channel width reduced the diffusion rate. Dominant mechanism in transverse spreading is secondary circulation produced by variations in transverse shear which itself is governed by aspect ratio

4 Tracer, conductivity probe

LAUFER 1951

Investigation of turbulent flow in a two dimensional channel

1 Experimental, smooth, duct

2 To investigate the field of fluctuating velocity components with respect to turbulent shear stress

3 The y and z large scale turbulence components are independent of Reynolds no in the channel centre. Small scale turbulence consistently has a maximum at $y/d = 0.7$. Velocity fluctuation/mean velocity near the wall is constant in a streamwise direction. Velocity fluctuation in y and z direction are similar in central region of channel. Small scale turbulence components increase proportionally with streamwise mean velocity fluctuation.

4 Hot film anemometer, static tube

LAUNDER 1975

Studies in convection

Contains chapters on:

Numerical prediction of three dimensional flows
A review of experimental data of uniform density free turbulent boundary layers
Developments in laser doppler anemometry at Imperial College
Behaviour of transpired turbulent boundary layers

LAUNDER, YING 1972

Secondary flows in ducts of square cross section

1 Simple, smooth, rough, experimental

2 To measure secondary flows in ducts with equally roughened surfaces

3 Secondary velocity in a fully developed flow through a square sectioned duct is independent of whether a duct is smooth or rough

4 Hot wire anemometry, pressure tappings

LEE, MAYS 1986

Hydraulic uncertainty in flood levee capacity

1 Theory, prototype, simple, rough

2 To explore the hydraulic uncertainties in the computation of the levee capacity based on the universal flow equations, in particular the uncertainty associated with the friction slope as this accounts for the major uncertainty in the hydraulic computation of natural floods.

3 The hydraulic uncertainty originates mainly from the inability of a mathematical model or an empirical equation to describe completely the real physical flood flow process. The uncertainty associated with the friction slope in the flood flow computation can be estimated directly from the information contained in the flood hydrograph and the channel section for a given location.

4 -

LEUTHEUSSER 1963

Turbulent flow in rectangular ducts

1 Simple, smooth, theoretical, experimental, duct

2 Investigation of turbulent mean flow in smooth rectangular ducts of varying aspect ratio

3 Axial mean velocity and wall shear stress show greater uniformity with increasing Reynolds no

4 Preston tube, pitot tube, micromanometer

LI, SHEN 1973

Effect of tall vegetations on flow and sediment

1 Theory, experimental, simple, rough

2 To investigate the effect of the drag due to vegetation upon flow and its effect on sediment transport

3 Different patterns or groupings have a significant effect on retardation of flow rates and sediment yields. Staggered patterns are most effective in reducing flow rate and sediment yield, next most effective are rows perpendicular to the flow direction. Average boundary shear stress is more sensitive to change of channel bottom slope and size of vegetation than variation of discharge and sediment size.

4 -

LIGGET, CHIU, MIAO 1965

Secondary currents in a corner

1 Simple, smooth, theoretical, experimental

2 To investigate the "weak" secondary current in straight non circular conduits

3 Calculation of secondary current only feasible using primary velocity distribution information

4 Hot film anemometer, Preston tube, manometer

LIN 1959

Turbulent flows and heat transfer

Contains chapters on:

Transition from laminar to turbulent flow
Turbulent flow
Statistical theories of turbulence
Conduction of heat
Convective heat transfer and friction in flow of liquids
Convective heat transfer in gases
Cooling by protective fluid films
Physical basis of thermal radiation

LIU, HWANG 1959

Discharge formula for straight alluvial channels

Useful reference in respect of insight into velocity, discharge and boundary layer theory

O`LOUGHLIN, ANNAMBHOTLA 1969

Flow phenomena near rough boundaries

1 Experimental, simple, rough

2 To develop an expression for velocity profiles close to rough boundaries and evaluate the stability criterion of the viscous sub layer on the smooth boundary between roughness elements

3 Resistance to flow over discretely roughened boundaries can be predicted by equations describing 2D flow variables. Wake layer behind roughness elements must be accounted for in velocity distribution over a rough boundary

4 -

LU, WILLMARTH 1973

Measurements of the structure of the Reynold`s stress in a turbulent boundary layer

1 Experimental, simple, duct, air, smooth

2 Discussion of measurements of the spatial scale and convection of the organized bursting structure. Measurement of Reynold`s stress throughout the boundary layer, examination of methods and measurements used to determine mean time between bursts and sweeps

3 Ejection of low momentum fluid from the wall is a dominant feature of the structure of the turbulent boundary layer. Near the wall bursts convected at less than mean flow velocity. Burst pattern grows in scale and distorts as it moves downstream. Mean time interval between events same for bursts as for sweeps. Time scale of events increases with distance from the wall. Bursts account for 77% of the Reynold`s stress in the boundary layer.

4 Hot wire anemometry

LUNDGREN, JONSSON 1964

Shear and velocity distribution in shallow channels

1 Simple, rough, theoretical

2 To determine bottom shear stress distribution in a shallow symmetrical channel

3 Fair approximation of shear stress if shear velocity is equated with depth normal to the bed assuming logarithmic velocity profile. For sloping bed channels a logarithmic profile is assumed with the local friction velocity used as a reference velocity instead of a mean value

4 -

Discussions by LEUTHEUSSER, MACAGNO, HUNG, TAYLOR 1964

Closure by LUNDGREN, JONSSON 1965

MACAGNO 1965

Resistance to flow in channels of large aspect ratio

1 Simple, rough, theoretical

2 To investigate the influence of aspect ratio on flow resistance

3 Shape factors identified to apply to laminar and turbulent flow theory to produce resistance coefficients

4 -

MARCHI 1967

Resistance to flow in fixed bed channels with the influence of cross sectional shape and free surface

1 Theoretical, experimental, simple, rough

2 To show validity of using formulae analogous to pipe friction formulae for the calculation of friction factors for open channels

3 Effect of channel section shape and free surface influence interpreted using a shape coefficient which acts as a multiplier of the hydraulic radius

4 -

McKEOGH, FRASER, ERVINE 1983

Velocity and turbulence measurements in air/water flows using laser doppler anemometry

1 Simple, smooth, experimental, cylinder

2 Experimental measurement of velocity and turbulence in two phase flow induced by air bubbles

3 LDA successfully measured velocity and turbulence levels, no seeding necessary

4 2D component LDA

MacMILLAN 1957

Experiments on pitot tubes in shear flow

1 Experimental, smooth, pipe

2 To investigate the effect of wall shear on total pressure readings

3 Effect of shear alone expressed as effective displacement of pipe centre toward higher velocity flow. Correction factor applied to velocity for shear near wall independent of Reynolds no. Effect of wall and shear together can be expressed as a total displacement of the effective centre

4 Pitot tube

McQUIVEY 1973

Principles and measuring techniques of turbulence characteristics in open channel flows

1 Experimental

2 To describe the statistical turbulence characteristics that best define the structure of the flow field and the relation between the characteristics and the equations of motion and energy.

3 Considerations necessary to produce meaningful turbulence measurements identified.

4 Hot film anemometer

McQUIVEY 1973

Summary of turbulence data from rivers, conveyance channels, and laboratory flumes

1 Experimental, prototype, simple, rough

2 To summarize turbulence characteristics of turbulent shear flows for the use of researchers. Data obtained using hot film anemometer

3 -

4 Hot film anemometers, pitot tube, current meter

McQUIVEY, KEEFER 1972

Measurement of velocity concentration covariance

1 Experimental, simple, smooth, rough

2 To review the governing equations for predicting diffusion and dispersion, to evaluate the longitudinal diffusion coefficient using the Boussinesq type turbulent mass transfer coefficient, to compare measured coefficients in the flow field with values obtained from surface flow

3 Boussinesq mass transfer relation appears to be adequate for describing scalar transport process. Longitudinal diffusion coefficients from within flow were within 20% of coefficients derived from surface flows

4 Hot film anemometer, conductivity probe

McQUIVEY, RICHARDSON 1969

Some turbulence measurements in open channel flow

1 Simple, smooth, rough, experimental

2 To investigate energy and turbulent shear stress distributions

3 Relation of turbulence intensities to rough and smooth beds and relation of vertical to longitudinal turbulence intensities identified

4 Hot film anemometer, pitot tube

MAGGIOLO, GUARGA, BORGHI 1969

A new method for measuring shear stresses in a hydraulically rough flow.

1 Theory, experimental, compound, rough.

2 Describe results obtained by the development of a new method for measuring shear stress in hydraulically rough flow by finding a relationship between dynamic pressure and static pressure , shear stress, geometric characteristic of flow and dimensions of measuring instrument.

3 Working in hydraulically rough flow in a straight, circular pipe, there is a function that relates the dimensionless numbers $(P-P_o)/t;y/k;R/k$, which are the only variables to appear.

4 Impact tube, orifice, manometer.

MATTHEW 1986

Velocity profiles and friction factor relationships for turbulent flow in smooth pipes, a reassessment of some earlier mixing length assumptions

1 Theoretical, experimental, smooth, pipe

2 To demonstrate how a relatively simple assumption about the mixing length can be justified and used to obtain an analytical description of the complete velocity profile from the wall to pipe axis in a fully developed turbulent flow in a smooth pipe, and hence obtain a compatible relationship between friction factor and Reynolds number

3 A 2 parameter assumption about mixing length is shown to be capable of explaining the salient features of the complete wall to axis velocity profile and of clarifying the corresponding friction factor/Reynolds number relationship.

4 -

MELLING, WHITELAW 1976

Turbulent flow in a rectangular duct

1 Simple, smooth, experimental, duct

2 To study developing turbulent flow in a rectangular duct

3 Results presented in respect of symmetry of mean flow; mean flow properties determined by axial pressure gradient and centreline mean velocity; mean velocity contours; axial turbulence intensity contours; transverse turbulence intensity contours; Reynolds shear stress contours; turbulence kinetic energy contours and secondary mean velocity contours

4 One component LDA, pressure tappings, orifice plate

MEYER 1971

Bed shear stress and velocity distribution in smooth triangular channels

1 Experimental, smooth, simple

2 Review of work on shear and velocity distribution in smooth simple channels and presentation of experimental findings.

3 -

4 Differential pressure transducer, Preston tube, point gauge

MILLER, RICHARDSON 1974

Diffusion and dispersion in open channel flow

1 Experimental, simple, rough

2 To relate the lateral diffusion coefficient to the flow parameters, determine the effect of mean velocity and resistance to flow on the longitudinal dispersion coefficient, determine the relative importance of the turbulent diffusion on the magnitude of the longitudinal dispersion process

3 Increasing velocity, slope and turbulence intensity caused an increase in lateral diffusion coefficient. Keeping velocity fixed and increasing resistance to flow, slope and turbulence intensity also increased the lateral diffusion coefficient. Lateral diffusion coefficient was small compared to the longitudinal diffusion coefficient. Longitudinal diffusion coefficient increases with both increased velocity and resistance

4 Fluormeter, hot wire anemometer

MISSOURI UNIVERSITY - Editors ZAKIN, PATTERSON, 1975

Turbulence in liquids, Proceedings of the 4th biennial symposium on turbulence in liquids

Contains chapters on:

Measurements by hot film/wire anemometry
Two phase flow
Applied turbulence measurements
Measurements by laser anemometry
Turbulent fluid structure interaction phenomena

Electrochemical methods of turbulence measurement
Separated turbulent flows
Turbulent burst phenomena

MORRIS 1955

Flow in rough conduits

1 Theory, experimental, simple, rough, pipe, channel

2 A concept of flow over rough pipe and channel surfaces is presented, the concept being based particularly on the effect of the longitudinal spacing of surface roughness elements and their associated vorticity streams.

3 The longitudinal spacing of the roughness elements is the roughness dimension of paramount importance in rough conduit flow. Three basic types of flow exist; isolated roughness flow, wake interference flow, and skimming flow.

4 -

MORRIS 1959

Design method for flow in rough conduits

1 Theoretical, experimental, rough, pipe

2 Presentation of design curves and methods for determining friction factors for turbulent flow in closed conduits and tranquil open channel flow

3 Rational method detailed compared to previous empirical relationships. Method needs verifying experimentally.

4 -

MULLER, STUDERUS 1979

Secondary flow in an open channel

1 Simple, rough, experimental

2 To investigate the influence of secondary flow cells on mass and momentum exchange

3 In the wall region flow above roughness elements is accelerated by advection and retarded by the shear stress gradient. Above smooth bed flow is accelerated by the shear stress and retarded by advection

4 Two component LDA, hot film anemometer

MYERS 1978

Momentum transfer in a compound channel

1 Compound, smooth, experimental

2 To quantify the momentum transfer due to flow interaction between channel/floodplain flow

3 Identification of magnitude of apparent shear force at interface of channel/floodplain flow due to momentum transfer with reference to its effect on discharge computation

4 Preston tube, point gauge, adj weir, manometer

MYERS 1982

Flow resistance in wide rectangular channels

1 Simple, smooth, experimental

2 To investigate the influence of aspect ratio on the friction factor

3 Friction factor and Reynolds no found not to conform to pipeflow relationship Relationship of friction factor to aspect ratio complex and influenced by secondary circulation and channel shape

4 Point gauge, volumetric tank, venturi, adj weir

MYERS 1984

Frictional resistance in channels with floodplains

1 Theoretical, experimental, compound, smooth

2 To evolve friction factor relationships for compound channels

3 Friction factors in compound channels are a function of Reynolds no and Reynolds no ratio for channel and floodplain, the latter being a function of channel geometry and effective depth

4 Miniature current meter, volumetric tank, orifice plate, manometer, point gauge

MYERS 1985

Flow resistance in smooth compound channels - experimental data

1 Experimental, compound, smooth

2 Presentation of data from laboratory experiments for use by other researchers

3 Selection of measured and calculated parameters provided; discharge, hydraulic radius, average section velocity, Darcy Weisbach friction factor, Reynolds no

4 Miniature current meter, point gauge, volumetric tank, orifice plate, manometer

MYERS, ELSAWY 1975

Boundary shear in channel with floodplain

1 Compound, smooth, experimental

2 To study the effect of the interaction mechanism on shear stress distribution

3 Interaction causes a reduction in channel shear and an increase in floodplain shear with greater influence at smaller depths

4 Preston tube, manometer, point gauge, adj weir

NAKAGAWA, NEZU, UEDA 1975

Turbulence of open channel flow over smooth and rough beds

1 Experimental, simple, smooth, rough

2 To investigate how the structure of turbulence is influenced by hydraulic parameters such as Reynolds number and Froude number.

3 Reynolds and Froude numbers kept nearly constant. Mean eddy size and intensity decrease with increase of roughness. Consequently inferred that the redistribution of turbulent energy in the flow over a rough bed may develop more rapidly than over a smooth bed. Flow field divided into three regions on the basis of a close analogy between the wave number space and the turbulent flow field. The velocity distributions have then been deduced from the viewpoint of the turbulent energy budget and comparisons made with existing formulae.

4 Hot film anemometer, pitot tube

NAKAGAWA, NEZU, TOMINAGA 1983

Turbulent structure with longitudinal secondary flow

1 Simple, smooth, rough, experimental

2 To investigate the interrelation between spanwise bed structures and the cellular secondary flow

3 Turbulence intensity and Reynolds stress increase in upflow as main flow velocity reduces c/f downflow areas

4 Hot wire anemometer

NAKAYAMA, CHOW, SHARMA 1983

Calculation of fully developed turbulent flows in ducts of arbitrary cross section

1 Simple, smooth, theoretical, experimental, ducts

2 To develop a numerical model to predict fully developed turbulent flows

3 Prediction of mean velocity pattern satisfactory but underestimates Reynolds stress fields

4 -

NALLURI, ADEPOJU 1985

Shape effects on resistance to flow in smooth channels of circular cross section

1 Experimental, compound, smooth, theory.

2 An analysis using experimental data to discover the resistance to flow in smooth channels of circular cross section.

3 The measured friction factors are larger than those for a pipe of equivalent diameter(D=4R)

4 Orifice plate meter, V-notch, manometer, venetioned-type tailgate.

NALLURI, NOVAK 1975

Turbulence characteristics in smooth bed channels

1 Experimental, simple, smooth

2 To determine the effect of channel shape and scaling effect on turbulence levels

3 In a channel of circular cross section the local mean velocity distribution is a function of the depth of flow. At large depths the crowning effect of the circular channel increases turbulence. Relative turbulence levels range from 4% to 10% of mean areal velocities. The depth/sublayer correlation suggests single relationship for any conveyance shape with free surface. The energy spectra in mean flow direction is essentially composed of low frequencies; ie < 5 Hz. Turbulence micro and macro scales of the flow field approach a maximum at mid depth

4 -

NALLURI, NOVAK 1973

Turbulence characteristics in a smooth open channel of circular cross section

1 Experimental, simple, smooth

2 To investigate the turbulence intensities and energy spectra in water flowing in a smooth channel of circular cross section

3 Varying depth produces marked variation in the distribution of turbulence intensities, the value of the intensities reflect the variation in channel shape with depth. Differnces in relative turbulence intensity values at equal values of depth/channel radius ratio and normalized depth are reduced in plots against depth/hydraulic radius. As depth increases the crowning effect of the channel cross section causes an increase in turbulence levels toward the free surface. As depth increases the flow changes from 2 to 3 dimensional. Measurements of turbulence along 30 degree radial axis are comparable to those measured along the vertical axis. The energy spectra in the x direction show varying frequency ranges, with the main energy content being in the low frequencies. Turbulence micro and macro scales of the flow field in the x direction approach a maximum at about mid depth.

4 Hot film anemometer, miniature current meter.

NAOT, RODI 1982

Calculation of secondary currents in channel flow

1 Simple, smooth, theoretical, experimental

2 To calculate the flow in channels with turbulence driven secondary motion with emphasis on open channel flow

3 Eddy viscosity distribution simulated correctly as well as separation in variances of x and y components that drive the secondary motions

4 -

NECE, GIVLER, DRINKER 1959

Measurement of boundary shear stress in an open channel curve with a surface pitot tube

1 Experimental, simple, smooth, bend

2 To study the use of a round surface pitot tube to measure local shear on a smooth boundary

3 Useful technique for determining shear magnitudes in uniform and non uniform flow provided that the secondary currents near the wall are small compared to the primary components

4 Pitot tube

NECE, SMITH 1970

Boundary shear stress in rivers and estuaries

1 Experimental, prototype, simple, rough

2 To determine suitability and accuracy of instruments used in field measurement of boundary shear stress

3 Preston tube device and array of miniature current meters described. Theoretical expression derived for determining the boundary shear stress on a hydraulically smooth surface and extended for use on transitional and hydraulically rough surfaces. No data obtained in steady flow conditions but good agreement between Preston tube and time averaged velocities in order to obtain shear stress

4 Preston tube, miniature current meters

NEZU, NAKAGAWA 1984

Cellular secondary currents in straight conduit

1 Experimental, rough, duct

2 To investigate the turbulent structure of secondary currents in air using longitudinal ridges to simulate bedforms in order to develop secondary currents

3 Reynolds shear stress nearly balanced with the production term of vorticity. Loss of mean flow energy is nearly balanced with the gain of energy made by the transverse Reynolds stress

4 Hot wire anemometer

NEZU, RODI 1986

Open channel flow measurements with a laser doppler anemometer

1 Experimental, theory, simple, smooth

2 To measure accurately the longitudinal and vertical velocity components in two dimensional, fully developed open channel flow over smooth beds

3 When log law is applied to wall region for relative depths < 0.2 all data can be described by universal constants independent of Froude and Reynolds numbers. Friction velocity can be applied accurately using constants. As Reynolds number becomes larger deviation from log law in outer region is appreciable. Distribution of eddy viscosity nearly parabolic

4 Laser doppler anemometer (2 component)

NICOLLET, UAN 1979

Continuous free surface flow over composite beds

1 Experimental, prototype, simple, compound, rough, smooth

2 To investigate flow characteristics in compound channels by determining independently the roughness characteristic of main channel and floodplains, determining independently the discharge of the main channel and floodplains, determining the total discharge under interactive flow conditions and measuring the velocity profile across the section. Experimental work is considered to represent certain sections of the Rhone.

3 Strickler roughness coefficient identified as satisfactory for use in simple channels. Experiments in compound channels produced a relationship relating flow in main channel to flow on floodplain; a momentum transfer coefficient; a discharge relationship incorporating

a empirical coefficient to account for the flow interaction between main channel and floodplain

4 -

NNAJI, WU 1973

Flow resistance from cylindrical roughness

1 Theoretical, experimental, simple, rough

2 A simulated vegetal component is studied in order to obtain a single parameter which could be used to characterize vegetative roughness and is expressible in terms of the geometric characteristics of the roughness type used.

3 A relationship was derived for the root mean square of the height of equally spaced roughness elements, in terms of the geometric characteristics of the elements. Considered to be a good estimation of the hydraulic resistance. Resistance parameter can be expressed as a power function of the roughness profile and roughness concentration

4 -

NOUTSOPOULOS, CHRISTODOULOU 1985

Flood plain and main channel flow interaction
Discussion of paper by Knight, Demetriou 1983

NOUTSOPOULOS, HADJIPANOS 1983

Discharge computations in compound channels

1 Compound, smooth, rough, experimental

2 To understand the flow characteristics of compound channels and so enable discharge computation for compound sections

3 Vertical interface boundaries overestimate discharge for shallow floodplain depths; planes of zero shear interface give more accurate representation

4 Preston tube, Dall tube, point gauge, orifice

ODGAARD 1978

Shear induced secondary currents

1 Simple, rough, theoretical, experimental

2 To propose an analytical relationship between secondary flow strength and transverse variation of shear velocity and to evaluate effect of secondary flow on velocity profile

3 Predicts flow and stress behaviour in open channel with symmetrical variation of bed shear stress in a transverse direction. Mechanism not identified

4 -

OKOYE 1970

Characteristics of transverse mixing in open channel flows

1 Experimental, simple, rough, smooth

2 To determine the parameters controlling the rate of transverse spreading. Calculation of transverse diffusion coefficient is emphasized

3 Transverse distribution was Gaussian at all flow levels. Variance of transverse distribution grew linearly in a streamwise direction. Transverse mixing coefficient varied through the depth, being greatest near surface.

4 Conductivity probe, pitot tube, transducer, camera

OLESEN 1985

A mathematical model of the flow and bed topography in curved channels

1 Theoretical, experimental, rough, bend, simple

2 To investigate the accuracy and stability of a 2D mathematical model used to predict flow and bed topography in large aspect ratio channel bends

3 Model incorporates fundamentals of interaction between bed shear distribution and sediment transport distribution. Model needs improving for bed shear stress direction in curved flow, secondary flow convection in prismatic channels, sediment transport rate and sediment transport direction on a sloping bed

4 -

OWEN 1954

Laminar to turbulent flow in a wide open channel

1 Experimental, theoretical, simple, smooth

2 To investigate the transition from laminar to turbulent flow in open channels

3 In the laminar range, the curve showing the relationship between the friction factor and the Reynolds number agrees well with the theoretical equation derived from the Navier Stokes equation. The Reynolds number at which flow first departs from the laminar state is approximately 4000. The transition from laminar to turbulent flow extends approximately between Reynolds numbers of 4000 and 11000. The data for the turbulent range do not agree with the Blasius smooth pipe curve, but show an almost constant value of the friction factor.

4 Point gauges

PACHECO-CEBALLOS 1983

Energy losses and shear stress in channel bends

1 Simple, rough, theoretical, experimental, bend

2 To study energy losses in bends and establish a correlation between maximum shear stress and maximum velocity head

3 Dependent upon bend radius /channel width ratio then free or forced vortex law can be applied. Loss of energy in bend established by comparing depth in bend with equivalent depth in straight channel

4 -

PARKER 1979

Hydraulic geometry of active gravel rivers

1 Prototypical, theoretical, simple, rough

2 To determine dimensionless bankfull power law relations for the hydraulic geometry of single channel streams with gravel perimeters

3 Three general rational regime relations formulated. Extending threshold canal theory to straight gravel bed streams culminate in stable channel paradox. Stable width is incompatible with active bed. Paradox explained by lateral redistribution of perimeter shear stress due to turbulent momentum transfer PARKER 1981

4 -

PARKER 1981

Hydraulic geometry of active gravel rivers
Closure of paper presented in 1979

PARSONS 1960

Effects of flood flows on channel boundaries

1 Prototype, experimental, simple, smooth, rough

2 To relate observed effects of floods to the channel geometry and nature of flood flow

3 Attempt at evaluating boundary shear in a bend based on effect of flow on revetment and comparison of data obtained with experimental work

4 Water surface level

PASCHE, EVERS, ROUVE 1983

Investigations on hydraulic effects of vegetated floodplains in compound cross sections and their influences on discharge capacity

1 Compound, rough, experimental, theoretical

2 Investigation of momentum exchange mechanism between main channel and vegetated floodplain

3 Identification of coherent flow structures (vortices) shows momentum exchange to be strictly ordered. Calculation of apparent shear stress acting on interface between channel and vegetated floodplain possible, dependent upon vegetation (roughness) characteristic and Reynolds no. Universal resistance law being developed

4 One component laser doppler anemometer, hydrogen bubble technique, camera

PASCHE, ROUVE 1985

Overbank flow with vegetatively roughened floodplains

1 Compound, rough, experimental, theoretical

2 Investigation into flow characteristics of complex cross section channels with non submerged floodplain roughness

3 Predictive method for compound channel discharge when bank vegetation not submerged developed. Width of vegetated zone and channel bank slope of minor importance in compound channels with bank vegetation. For channels and floodplains with uniform roughness then banks exert pronounced influence on compound channel discharge

4 One component LDA, pressure tappings, Preston tube, camera

PATEL 1965

Calibration of the Preston tube and limitations on its use in pressure gradients

1 Experimental, smooth, pipe

2 A revised calibration is presented for a Preston tube in fully developed flow

3 Revised calibration differs appreciably from original calibration of Preston. From the calibration curve possible to determine the constants appearing in the logarithmic region of the wall. In severe favourable and adverse pressure gradients the Preston tube overestimates the skin friction. The pressure gradient parameter was found not to define the flow in the wall region completely but limits of acceptable accuracy for its use in this region were defined.

4 Preston tube, pitot tube, piezometric tappings

PATEL, HEAD 1969

Some observations on skin friction and velocity profiles in fully developed pipe and channel flows

1 Experimental, pipe, air

2 To measure skin friction and mean velocity profiles in fully developed pipe and channel flows for Reynolds numbers from laminar to fully turbulent flow

3 For pipe flow; with disturbed entry conditions transition regime starts at a Reynolds no of 2000 and ends at 3000; up to this no flow is intermittently turbulent; above this no flow is fully turbulent; between Re of 3000 and 10000 velocity distribution is poorly described by 1/7 power law and so there is no connection between this power law and skin friction; velocity distribution is substantially logarithmic outside the sublayer; additive constant differs from that in the law of the wall only agreeing for Re > 10000 For channel flow; with disturbed entry conditions transition regime extends from Re no of 1350 to 3000; flow is continuously turbulent for Re > 1800; for Re > 2800 skin friction results agree with 1/6 power law; velocity distribution outside sub layer is logarithmic Difficult to accurately specify fully developed turbulent flow

4 Pitot tube, orifice plate

PERKINS 1970

The formation of streamwise vorticity in turbulent flow

1 Simple, smooth, experimental, theoretical, duct

2 Investigation of secondary flow induced by non uniform wall turbulence

3 Deduction of secondary current direction for the corner boundary layer, the salient edge flow and in the non uniform boundary layer

4 Hot wire anemometer

PERRY, SCHOFIELD, JOUBERT 1969

Rough wall turbulent boundary layers

1 Experimental, theoretical, simple, duct, air, rough

2 Description of detailed experimental study of turbulent boundary layer development over rough walls in both zero and adverse pressure gradients

3 Two major roughness types distinguished;

(a) Nikuradse Clauser correlation scheme type

(b) Roughness typified by depressions or narrow lateral grooves do not follow correlation scheme

For fully rough flow the roughness function is a function of the length of scale. For flow over (a) type length of scale function is proportional to scale of the roughness. Foth of scale function is not proportional to roughness scale

For pipe flow length of scale function apparently proportional to pipe diameter

Zero pressure gradient boundary layers developing on (b) has a constant wall shear stress

Skin friction coefficients determined from pressure tappings agreed with values determined using momentum integral method

4 Prandtl tubes

PETRYK, GRANT 1978

Critical flow in rivers with floodplains

1 Compound, rough, theoretical, field

2 Computational method for establishing critical depth for compound channel to allow more accurate discharge calculation

3 Development of discharge weighted Froude no model

4 -

PETRYK, SHEN 1971

Direct measurement of shear stress in a flume

Details floating element balance and compares results with readings obtained from Preston tube

PILLAI 1970

On uniform flow through smooth rectangular open channels

1 Simple, smooth, experimental, theoretical

2 To identify parameters that reflect the influence of channel shape on friction factor

3 Incorporation of wetted perimeter into friction factor/Reynolds relationship allows aspect ratio (shape effect) of rectangular channels to be accommodated in pipe flow formula

4 -

POSEY 1983

Discharge assessment in compound channel flow
Discussion of paper by Wormleaton, Allen and Hadjipanos 1982

POSEY, CHIU 1973

Stochastic nature of secondary currents in open channels

1 Simple, smooth, experimental

2 To attempt to measure secondary currents

3 Primary velocity distribution affected by secondary flow

4 -

POSEY 1967

Computation of discharge including overbank flow

1 Compound, rough, theoretical, experimental

2 To identify the best method of computing discharge in compound channels

3 Considered that floodplains treated separately to main channel with main channel shear boundary being included as part of wetted perimeter solely for main channel

4 -

PRESTON 1954

The determination of turbulent skin friction by means of pitot tubes

1 Experimental, smooth, pipe

2 To determine the local turbulent skin friction on a smooth surface using a round pitot tube

3 Simple and accurate method of measuring skin friction developed, area near wall 0.1 of boundary layer thickness where conditions depend only on tractive force, fluid density and kinematic viscosity and a characteristic length. Velocity distribution in this region is universal. Velocity distribution can be used to determine skin friction from pitot tube traverses if effective centre of pitot tube near wall can be established. Turbulence intensity near wall can be determined using non dimensional relationship comprising tractive force, fluid density, kinematic viscosity and a characteristic length

4 Pitot tube, pressure tappings

PRINOS, TOWNSEND 1983

Estimating discharge in compound open channels

1 Experimental, theoretical, smooth, rough, compound

2 Presentation of initial results of a theoretical and experimental study concerned with estimating the discharge of rivers in times of flood when interaction between flows in the main channel and those in the adjoining flood plain zones can significantly influence the stage discharge relationship for the system.

3 Momentum transfer mechanism generated in the junction regions of highly compound channels tends to reduce boundary shear stress, velocity and discharge in the main channel and increase boundary shear stress in the flood plain zone. Strength of the mechanism decreases with an increase in relative channel width and relative roughness and increases with a decrease in relative depth. Apparent shear stress provides information on the strength of the mechanism. Proposed methodology incorporates apparent shear stress in the calculation of velocity in the flood plain gives satisfactory results. Method assumes same friction factor under interacting and isolated conditions.

4 Preston tube, static tube, piezometric tappings

PRINOS, TOWNSEND 1984

Prediction of main channel/flood plain flow interaction with FEM

1 Experimental, compound, smooth, theory.

2 Description of a finite element model (FEM)for predicting velocity distributions in fully-developed compound channel flows.

3 Numerical model works well for wide main channel in compound channel. For narrow channel errors in simulation occur as model cannot reproduce accurately observed isovel patterns and predicts incorrectly mean velocities in channel and on flood plain due to strong momentum

transfer mechanism in mixing region only being taken partly into account.

4 Pitot tube, differential pressure transducer, digital indicator, propeller current meter.

PRINOS, TOWNSEND 1985

Flood plain and main channel flow interaction
Discussion of paper by Knight, Demetriou 1983

PRINOS, TOWNSEND, TAVOULARIS 1985

Structure of turbulence in compound channel flows

1 Compound, smooth, rough, experimental

2 To investigate structure of turbulence in wide and narrow channels and to compare measured apparent shear stress and estimated values based upon boundary shear stress measurements

3 Longitudinal and vertical turbulence intensities higher in interface zone than in central part of channel. Turbulence intensities increase with increase of relative boundary roughness and with a decrease in relative depth Negative shear stress due to large eddy transport in interface zone. Numerical modelling of Reynolds stress should be based on advection, diffusive transport, turbulence production and viscous dissipation

4 Hot wire anemometer

PRUS-CHACINSKI 1955

Helical flow in open channel bends

1 Simple, rough, smooth, experimental, bends

2 Investigation of helical flow in open channel

3 Helical component dissipates slowly once formed; sensitive to cross currents at entry; causes great variation in sediment transporting capability of flow; evidence of helical motion in all channel forms; intimately related with meandering channels

4 Dye, point gauges

PYLE, NOVAK 1981

Coefficient of friction in conduits with large roughness

1 Rough, prototype model, theoretical, experimental, simple

2 Using results of experiments of friction losses in conduits with large roughness as a basis for determination of reference datum to enable computation of friction loss without further experimental work. Study limited to rough turbulent zone.

3 A mathematical model set up for the computation of friction coefficient Model successfully tested by experiments in channels with uniform and random roughness size and shape. Applicable to conduits with roughness elements of any shape and based on the coefficient of drag.

4 Orifice, manometer.

QUINTELA 1982

Minimum specific energy in compound open channel
Discussion of paper by Blalock, Sturm 1981

RAJARATNAM 1965

On the Preston tube with a hemispherical nose

1 Experimental

2 To compare Prandtl tube and Preston tube differential pressure readings

3 Good correlation though d/D for Prandtl = 0.3 against accepted d/D for Preston tube of 0.6

4 Preston tube, Prandtl tube

RAJARATNAM, AHMADI 1980

Interaction between main channel and flood plain flows
Closure

RAJARATNAM, MURALIDHAR 1969

Boundary shear stress distribution in rectangular open channels

1 Simple, smooth, experimental

2 Supercritical flows studied due to measurement of velocity and shear at low velocities being difficult. Shear stress distribution in smooth rectangular channels.

3 Side wall to bed shear stress varies with aspect ratio; velocity distribution exhibits logarithmic profile normal to bed for 89% of channel width

4 Pitot tube, Preston tube, orifice meter, piezometers

RAJARATNAM, MURALIDHAR 1970

The screw driver probe

1 Simple, experimental

2 To compare screw driver probe with pitot tube in respect of measuring static pressure in 2 and 3D flow

3 In 2 and 3D flow SDP accurate for flow vectors up to 30° from normal, more accurate than pitot tube.

4 Screw driver probe, Pitot tube

RAJARATNAM, AHMADI 1979

Interaction between main channel and floodplain flows

1 Compound, smooth, rough, experimental

2 Study of main channel and floodplain flow interaction

3 Lateral transfer of longitudinal momentum detailed, velocity profiles above floodplain level in both floodplain and main channel similar. Shear at interface increases on floodplain and reduces in main channel with interaction

4 Pitot tube, Preston tube, pressure probes, transducers, point gauges

RAJARATNAM, AHMADI 1981

Hydraulics of channels with floodplains

1 Compound, smooth, rough, experimental

2 To investigate flow interaction between main channel and floodplain; study the general flow structure; study nature of interaction zone

3 Floodplain bed shear stress is increased by flow interaction, converse is true for main channel. Apparent shear stress exerted by main channel on floodplain is a function of main channel/floodplain depths

4 Pitot tube, Preston tube, transducers, flowmeter, pressure probes

RAO, NARASIMHA, NARAYANAN 1971

The bursting phenomenon in a turbulent boundary layer

1 Experimental, simple, smooth, duct

2 To study the frequent periods of activity, ie bursts, noticed in a turbulent signal

3 Bursting interval related to Reynolds no. Over a wide Reynolds no. range mean burst period relates to the outer layer variables rather than the inner layer, ie the wall. Burst intervals distributed according to the log normal law. Dynamics of the energy balance in a turbulent boundary layer can only be understood on the basis of a coupling between the inner and outer layers

4 Hot wire anemometry, pitot tube, piezometric tappings

REHME 1974

Turbulent flow in smooth concentric annuli with small radius ratios

1 Experimental, theoretical, simple, annulus, air, smooth

2 To determine position of zero shear stress and consequently wall shear stress at the inner and outer walls

3 Pressure drop coefficients are dependent upon radii ratios. Zero shear stress is not coincident with maximum velocity. Velocity and turbulence distributions are greatly disturbed by spacers, core rods or wires. Disturbances particularly affect position of zero shear stress. At high Reynolds numbers the methods based on the laws of the wall used to interpret measurements in annuli and rod bundles with artificial surface roughnesses are sufficiently well suited for the calculations of the flow parameters in smooth annuli

4 Pitot tube, orifice plate, Preston tube, hot wire anemometer

REPLOGLE, CHOW 1966

Tractive force distribution in open channels

1 Simple, rough, experimental, theoretical, pipe

2 To determine flow constants referable to turbulence and secondary flow by comparing computer generated tractive force distributions to measured distributions

3 Increasing relative roughness reduces maximum velocity and changes tractive force distribution; channel geometry important in establishing secondary currents with their associated influence on tractive force; tractive force dependent upon aspect ratio; tractive force is independent of Reynolds and Froude no; maximum tractive force near centre of channel

4 Pitot tube, manometer

RICHARDSON, McQUIVEY 1968

Measurement of turbulence in water

1 Theoretical, experimental, simple, smooth, rough

2 To describe a method of measuring turbulence in water using hot film anemometers; also to review the theory of the constant temperature hot film anemometer

3 Method developed for measuring turbulence in dirty water based on the hypothesis that dirt and air on the sensor decrease the mean voltage for a given velocity but that for the frequencies encountered in water do not affect the frequency response of the sensor to velocity fluctuations. Relative turbulent intensities at a given point in flow increase with an increase in Reynold`s number. Increase more pronounced over a smooth boundary than a rough boundary.

4 Hot film anemometer

ROBINSON, ALBERTSON 1952

Artificial roughness for open channels

1 Rough, theory, experimental, simple.

2 Study to choose an artificial roughness and test it in a range where the channel would be so rough that viscous forces would be relatively insignificant.

3 A roughness standard such as exists for pipes may be set up for open channels with rough boundaries. The channel cannot be considered as infinitely wide for values of relative roughness > 10, as effect of side walls becomes important. The Chezy resistance coeff remains constant over the range of Reynolds No observed for a particular value of relative roughness.

4 Point gauge.

ROUSE 1965

Critical analysis of open channel resistance

1 Simple, smooth, rough, experimental, theoretical

2 Literature review of existing open channel resistance theory

3 Secondary currents considered important for aspect ratios < 5

4 -

ROZOVSKII 1957

Flow of water in bends of open channels

Contains chapters on:

Theoretical investigations of flow in bends of channels.
Distribution of longitudinal and transverse velocities across the width and length of a bend.
Laboratory and field investigations of flow in channel bends.
Comparison of theoretical and experimental data.

SAMUELS, GRAY 1982

The FLUCOMP river model package: an Engineers guide

1 Theoretical, prototype, experimental, rough, compound

2/3 To predict water levels and discharge for one dimensional flows along a river channel. Discharges varying in time or steady at each site along a river can be investigated. The simplest problem that can be treated with the package is the calculation of a steady flow water surface profile along a regular channel. More complex problems can be treated such as the passage of a flood along the tidally influenced reach of a natural river in which flow occurs over the flood plain and the water level is, perhaps, artificially controlled by bridges, weirs and sluices. The methodology of approach for describing the physics of the river flow is described.

4 -

SAMUELS 1984

Computational modelling of open channel flow: an analysis of some practical difficulties

1 Theoretical, prototypical, experimental, rough, simple, compound

2 To indicate the practical problems in constructing one dimensional river problems and the limits of our current knowledge and identify practical conclusions.

3 The specification of survey of a river for constructing a numerical model must include a limit on the ratio between cross sectional areas below normal or flood stages at adjacent cross sections. When Priessman`s scheme is used in the numerical model this ratio should lie between 0.65 and 1.50. The roughness parameter derived in calibrating a model may differ from that usually assessed by an engineer from site experience because of the way in which the conveyance of compound cross sections is calculated. A model of a tidal reach of a river should employ an iterative solution technique to minimize errors in the total volume of water.

4 -

SARGENT 1979

Variation of Mannings n roughness coefficient with flow in open river channels

1 Prototype, simple, rough

2 To study the effect of varying channel discharge on the roughness coefficient

3 Mannings n varies with flow tending to an asymptotic value as bankful discharge is reached

4 -

SARMA, LAKSHMINARAYANA, RAO 1983

Velocity distribution in smooth rectangular open channels

1 Simple, smooth, experimental, theoretical

2 To study velocity distribution in open channels for subcritical smooth turbulent flow

3 Froude no and aspect ratio do not influence velocity distribution in the wall region adjacent to the bed. Away from the bed the lateral velocity distribution in the wall region affected markedly by dip in vertical velocity distribution

4 Pitot tube, manometer, point gauge, adj weir

SARMA, SASIKANTH 1965

Evaluation of Mannings n for steady non-uniform flows

1 Experimental, rough, simple,

2 To determine Mannings n for irregular, non uniform flow

3 It can be demonstrated that by using the energy slope, Mannings n can be evaluated accuratley for any irregular, non uniform, steady flow in a uniform channel with banks and bed of same roughness.

4 Point gauge.

SAYRE, ALBERTSON 1963

Roughness spacing in rigid open channels

1 Experimental, simple, rough

2 To determine the effect of roughness spacing on open channel flow

3 Variation of the Chezy resistance function with relative roughness is logarithmic. Velocity distribution in the vertical when the roughness pattern is relatively dense is similar to that described by the von Karman Prandtl equations for rough boundaries. The general resistance diagram and the Colebrook White transition function are found to be applicable to uniform flow in wide, rigid boundary open channels. The von Karman turbulence constant is independent of the roughness pattern

4 Pitot tube, point gauge

SAYRE, CHANG 1968

A laboratory investigation of open channel dispersion processes for dissolved, suspended, and floating dispersants

1 Simple, experimental, rough

2 To study longitudinal and lateral dispersion processes in flow

3 Longitudinal dispersion well represented by 1D Fickian diffusion equation. Longitudinal dispersion coefficient (dissolved dispersant) calculated using Elder`s (1959) equation; entry length before Fickian equation applies determined. Lateral dispersion represented by 2D Fickian diffusion equation, entry length before applicability

determined. Lateral dispersion coefficient 3% of longitudinal dispersion coefficient. Surface dispersion rate distorted by secondary currents

4 Fluorometer

SCHLICHTING 1949

Lecture series Boundary layer theory, Part 2, Turbulent flows

Investigation of turbulent flow theory including general remarks on turbulent flow, theory of turbulent flow, pipe flow, friction drag of a flat plate in longitudinal flow, turbulent friction layer in accelerated and retarded flow, determination of profile drag from the loss of momentum, origin of turbulence, calculation of the turbulent friction layer.

SCHOELLHAMER, PETERS, LAROCK 1985

Subdivision Froude number

The development and testing of a subdivision Froude number by which the flow regime in each of three major cross sectional subdivisions; i.e. main channel and two floodplains is described

SCHUYF 1966

The measurement of turbulent velocity fluctuations with a propellor type current meter

1 Experimental, simple, water, air

2 To study the extent to which turbulent velocity fluctuations are measured correctly with a propellor type current meter

3 To measure isotropic turbulence intensity correctly longitudinal integral scale should be 2 to 3* the rotor diameter. Sensitivity of non axial components may be neglected for large scale movements; influence of the wake of the meter frame may be neglected for mean velocity U=0.4 m/s.

4 Propeller current meter, hot wire anenometer

SELLIN 1964

A laboratory investigation into the interaction between the flow in the channel of a river and that over its floodplain

1 Compound, smooth, rough, experimental

2 Review of existing computational methods and their comparison with experimental data

3 Identifies the momentum transfer mechanism in terms of Mannings n. Compares theoretical interface boundaries with experimental data. Details frequency of vortex shedding

4 Pitot tube, pressure tappings, min current meter, camera, adj weir

SELLIN 1970

Some experiments with the hot film anemometer in water

1 Simple, smooth, experimental, cylinder

2 To assess effect of inclining probe head to incident flow

3 Significant increase in measured turbulence when probe not aligned to flow

4 Hot film probe, oscilloscope

SHIH, GRIGGS 1967

A reconsideration of the hydraulic radius as a geometric quantity in open channel hydraulics

1 Simple, smooth, experimental

2 To investigate the validity of the hydraulic radius as a representative geometric parameter in the computation of turbulent uniform flow

3 For particular channel conditions increase in mean velocity or decrease in resistance is attributed to lower aspect ratio. If aspect ratio > 2 then use of R is valid, if < 2 then effect of channel shape on R is neccessary

4 Point gauges, orifice, volumetric tank, sluice gate, adj tailgate

SHUKRY 1950

Flow around bends in an open flume

1 Simple, smooth, experimental, bend

2 Investigation of the spiral motion of flow around bends

3 Spiral motion exists in straight as well as curved channels. Spiral motion due to centrifugal force not uniform around bend; strongest at mid section of bend aligned down toward bed. Strength of motion dependent upon Reynolds no and bend radius/channel width ratio. Free vortex theory defines velocity distribution and water surface profile at point of maximum surface depression

4 Pitot sphere

SHUKRY 1963

Boundary shear stresses in curved trapezoidal channels
Discussion of paper by Ippen, Drinker 1962

SIEBERT, GOTZ 1975

A study on the deformation of secondary flow in models of rectangular meandering channels

1 Simple, smooth, experimental, meander

2 To investigate secondary flows in meandering channels

3 Helical flow exists but is not fully developed in meander bends. Transverse motion is asymmetric to channel axis near bed, similarly longitudinal flow is asymmetric to channel axis

4 Hot film anemometer

SIMON, BLENCH, NEILL 1963

Friction factors in open channels
Discussion on ASCE task force paper 1963

SMITH 1978

Effect of channel meanders on flood stage in valley

1 Experimental, theory, simple, compound, rough, meanders

2 To study the flow exchange process and its effect on stage of a meandering channel within a valley floodplain

3 Results indicate that for a meandering channel in a valley there is an interaction between the channel flow and valley flow. The nature of the interaction varies with stage, in that the channel flow remains dominant when the overbank flow is relatively shallow, but may become insignificant when the overbank flow is deep. Once the valley flow is dominant, the presence of the meandering channel can actually produce greater stages than would occur if the channel were absent. The extra flow resistance produced by the channel more than offsets the added area that it provides. It can be expected that this effect will be even more pronounced if channel bank vegetation extends above the level of the valley floor.

4 Point gauges

SOLIMAN, TINNEY 1968

Flow around 180° bend in open rectangular channels

1 Simple, smooth, theoretical, experimental, bend

2 To attempt to minimize energy loss in a 180 degree bend

3 Presence of vanes causes flowlines to parallel channel boundary. If channel width/channel radius ratio is < 0.15 and Froude < 0.6 then losses in bend similair to those in straight channel

4 Pitot tube, point gauge, dye, micromanometer

SOOKY 1964

The flow through a meander floodplain geometry

1 Experimental, simple, compound, smooth

2 To investigate the resistance to flow through a meander floodplain geometry as a function of stage. Theoretical considerations are presented concerning the plan form of meandering channels and the nature of increase in resistance

3 Geometric similarity of meander patterns cannot be described in terms of linear relationships independent of dynamic flow parameters. Friction factor increases with Froude and Reynolds Number. The flow in a meander floodplain combination is subject to increased resistance compared to dividing flow between channel and floodplain flow fields.

4 Prandtl tube, oscilloscope, transducer, point gauge

SOULSBY 1980

Selecting record length and digitization rate for near bed turbulence measurements

1 Prototype, rough, coast

2 To assess the effect of loss of low and high frequency contributions, stationarity, statistical variability, sensor response and size of data set on the accuracy of measured values of turbulence parameters.

3 Estimates of the errors associated with the factors detailed above are presented and their differing relative importance for different turbulence parameters discussed.

4 Electro magnetic current meter

STEFFLER, RAJARATNAM, PETERSON 1985

LDA measurements in open channel

1 Experimental, simple, rough, smooth

2 An extensive set of "u" velocity measurements were made for three aspect ratios, measurements are presented

3 Longitudinal velocity measurements in the viscous sublayer agree well with the linear form of the law of the wall. In the central region of the channel the mean velocity measurements agree with the logarithmic form of the law of the wall. Near the side walls the velocity profiles drop of from the log law line, exhibiting a significant dip in the velocity profile near the water surface. Longitudinal shear stress profile is linear in the centre of the channel, but in the wall region the profiles are complex

4 Laser doppler anemometer

STRAUB, SILBERMAN, NELSON 1956

Open channel flow at small Reynolds numbers

1 Experimental, simple, compound, smooth, rough.

2 Establishing physical relationships of flow at small Reynolds numbers using only flows with Froude Number less than unity and at high Weber Numbers.

3 Friction and velocity distribution for flow in smooth, open channels at small Reynolds Number are equal to that for flow in closed conduits. Friction in rough channels may be similar to friction in rough pipes or plates. Shape of channel does not have important effect on friction for turbulent flow in smooth channels at low Reynolds Number. The lower critical Reynolds no for transistion between laminar and turbulent flow in smooth channels depends to some extent on channel shape.

4 -

SUMER, DEIGAARD 1979

Experimental investigation of motions of suspended heavy particles and the bursting process

1 Experimental, simple, smooth, rough

2 To study the turbulence structure near the wall; i.e. bursting process and its effect upon particle movement

3 Identified that particle near bed experiences upward force due to instantaneous pressure gradient. Determined for single particle above a rough and smooth bed. Lift force increases with increasing roughness but disappears with distance above the bed. Bursting process is quasi cyclic in form, not random

4 Miniature flowmeter, point gauges, orifice plate, camera

SUMER, MULLER 1982

Mechanics of sediment transport

Contains chapters on:

Flow structure as related to sediment transport
Single particle dynamics
Initiation, formation and behaviour of ripples and dunes
Transport of sediment in suspension
Sediment transport in steep channels
Other sediment transport problems

TAGG 1985

Computational modelling of the River Stour, Dorset UK

1 Theoretical, experimental, prototype, compound, rough

2 To describe the application of the one dimensional FLUCOMP model to the Christchurch reach of the River Stour.

3 By utilising the results from a physical model of the Iford reach, it was possible to represent the head loss at the bridges, resulting from complex flows around and through the structures, by the one dimensional model. Without the physical model this would have been difficult. A strength of a physical model is that it identifies and reproduces local effects, such as surcharging of the bridge arches and can approximate the energy losses produced by vegetation and buildings. Complementary to this the computational model is better suited for representing larger reaches and reproducing global effects, such as the area dominated by tide or the backwater effect of channel works. Although the absolute accuracy of the models discussed here is approximately ± 0.1m, the sources of error are different. For the physical model the accuracy of the moulding, scale effects and repeatability of measurement are the dominant factors. The computational model accuracy, on the other hand, is controlled by the mathematical representation of the river and the numerical methods used to solve the model equations. Both models are of course subject to the precision with which the prototype data can be given.

4 -

TAMAI, IKEYA 1985

Three dimensional flow over alternating point bars in a meandering channel

1 Theoretical, experimental, simple, bend, smooth

2 To develop a mathematical model to simulate three dimensional flow over point bars in a meander channel and to compare model with experimental results

3 Mathematical model simulates secondary flow double cell pattern in meander channel with alternating point bars. Simulation of primary velocity isovels indicates that combination of surface shear stress and k-e model not sufficient to reproduce flow patterns in meander channel of low aspect ratio. Bed shear stress distribution reproduced qualitatively by k-e model.

4 Hot film anemometer, point gauge

TAMAI, IKEUCHI, YAMAZAKI, MOHAMED 1983

Experimental analysis on the open channel flow in rectangular continuous bends

1 Experimental, simple, bend, smooth

2 To investigate transverse surface gradient, primary and secondary velocity fields in meander bends

3 Transverse water surface profile nearly horizontal at entry and exit of bends Maximum primary velocity at certain distance below water surface. Primary and secondary flow fields vary throughout bend, no fully developed section. In case of continuous bends, i.e. meanders, residuary secondary circulation from previous bend prevails into next bend. In respect of longitudinal momentum equation, inertia terms and longitudinal component of the centripetal force are dominant. In the transverse momentum equation, transverse pressure gradient and centripetal forces are dominant.

4 Miniature current meter, static tube, point gauge

TAMAI, HIROSAWA 1986

A field observation of the transverse variation of shear and diffusivity in the Tama river, Tokyo

1 Prototype, simple, rough

2 To investigate and understand the variation of hydraulic quantities in a section during a low flow stage.

3 The vertical profile of the longitudinal velocity is explained by a quadratic function of the distance from the bottom with slip velocity at the bottom. Depth averaged velocity shows proportional variation to the water depth in a section. Local shear velocity can be estimated by the vertical line method of partition of a section. Transverse variation of the local shear velocity is large and the representative shear velocity for a section is insufficient to describe the variation of turbulence characteristics. Non dimensionalized transverse eddy diffusivity suggest smaller values than obtained by previous researchers.

4 Current meters, electromagnetic current meters

TAYLOR 1961

Exploratory studies of open channel flow over boundaries of laterally varying roughness

1 Experimental, prototype, simple, smooth, rough

2 To determine how friction factor varies with roughness distribution ratio, and to study flow structure including secondary flow as detailed by velocity profiles

3 Bed friction factors consistent with Karman Prandtl equation for turbulent flow. Overall friction factor varied consistently with hydraulic radius or relative roughness. Subdivision of turbulent flow into hydrodynamically independent zones is not generally possible as bed generated turbulence is diffused throughout the channel. Velocity profiles indicate the existence of strong secondary circulation.

4 -

THIJSSE 1949

Formulae for the friction head loss along conduit walls under turbulent flow

1 Pipe, theoretical, rough

2 Consideration of a conduit with hydraulic radius R through which a fluid passes with mean velocity v. Slope or total energy line is 1, energy loss being caused by wall friction only. Roughness of walls caused by protuberances with height k.

3 Proposal not to use experimental formulae for resistance but to calculate the head loss by means of logarithmic formulae. Important that length k has same order of magnitude as height of inequalities of surface

4 -

TINGSANCHALI, ACKERMANN 1976

Effects of overbank flow in flood computations

1 Compound, rough, theoretical, field

2 To derive continuity and momentum equations to describe main channel and berm flows when both storage and dynamic conditions apply.

3 Channel/berm interface divided as for POSEY. Momentum correction factor derived from net momentum flux/momentum flux ratio for each section. Model water surface levels and discharges produced using Delft node and branch computational procedure

4 -

TOEBES, SOOKY 1967

Hydraulics of meandering rivers with floodplains

1 Compound, smooth, experimental, meandering

2 To investigate the internal flow characteristics of meandering channels with floodplains and to supply empirical constants to represent this flow in a flood routing model

3 For analysis horizontal interface at floodplain level is used. Interaction losses increase with decreasing mean velocity and variation in overbank flow depth. Energy loss dependent upon Froude and Reynolds. Helicoidal pattern more pronounced in meandering channel with floodplain flow than solely for meandering channel.

4 Pitot tube, point gauge, transducer

TOWNSEND 1968

An investigation of turbulence characteristics in a river model of complex cross section

1 Compound, smooth, experimental

2 Experimental investigation into nature of turbulence characteristics in an asymmetrical compound channel

3 Turbulence intensity for low depths at channel/floodplain interface is approximately 40% higher than at the wall or on the floodplain. Increasing the discharge results in increase in depth and reduction in turbulence intensity. Reynolds no ratio of floodplain to channel increases with reduced floodplain depth, indicative of momentum transfer mechanism

4 Hot film anemometer, pitot tube, camera, dye

TOWNSEND 1976

The structure of turbulent shear flow

Contains chapters on

Turbulent flow
Pipes
Open channels
Boundary layer
Wall jets
Convection

TRACY, LESTER 1961

Resistance coefficients and velocity distribution, smooth rectangular channel

1 Simple, smooth, experimental

2 To establish the effect of the channel side walls on the velocity distribution and resistance to flow

3 Flow is symmetrical about the channel axis. Vertical velocity profiles exhibit a logarithmic profile. In the vicinity of the walls the maximum velocity is depressed below the surface. No definite conclusions on secondary flow though transverse motion evident from velocity profiles

4 Piezometric tappings, point gauges, venturi, orifice

TRACY 1965

Turbulent flow in a three dimensional channel

1 Simple, smooth, experimental, duct

2 To measure the turbulent structure of flow in a corner; to identify the role of turbulence in secondary flow

3 Secondary flows are present in long channels of noncircular shape; the y and z fluctuating velocity components establish the secondary motion and are controlled by channel configuration. Magnitude of velocity fluctuation next to the boundary is controlled by the boundary. Boundary causes y component to be greater in the vertical and the converse in the horizontal so developing corner secondary flow. Secondary flow inward toward the corners and outward along the boundaries

4 Hot film anemometer, pressure tappings, micromanometer

TRACY 1976

The structure of a turbulent flow in a channel of complex shape

1 Compound, smooth, experimental, duct

2 To study the turbulent and secondary mean motions generated in the large section of the compound channel and to evaluate their effect in momentum transfer

3 The variation in fluctuating velocity components in the y and z direction are probably responsible for secondary motion; secondary motion magnitude is dependent upon the channel corner angle; secondary motions are the momentum transfer mechanism; boundary effects produce shear forces greater than those solely attributable to pressure; secondary motion transfers momentum into corner to compensate for excess shear force; secondary motions equalize boundary stress over boundary this accounting for ability to use roughness coefficients to compute flow in open channels

4 Hot wire anemometer

TRESKE 1980

Mathematical simulation of unsteady floodflows in compound prismatic and meandering channels

1 Theoretical, experimental, smooth, compound

2 To assess the ability of mathematical models to simulate unsteady flow in open channels

3 Several numerical solutions of unsteady flow equations are examined and are tested against experimental data from compound prismatic, meandering and confluence channels

4 Point gauges

TROPEA 1983

A note concerning the use of a one component LDA to measure shear stress terms Theory

1 -

2 To assess the statistical uncertainty in measuring shear stress terms using a one component LDA

3 Reynolds shear stress and turbulence intensity measurement accuracy defined in respect of probe alignment

4 One component LDA

TURNER, LANGFORD, WIN, CLIFT 1978

Discharge depth equation for shallow flow

1 Experimental, simple, rough

2 To compare hydraulic characteristics of shallow flow over soil and vegetated surfaces with flow over soils with an uneven surface

3 Shallow flow is inadequately described by deeper flow equation incorporating Mannings n. Flow over undulating bare soil differs in behaviour from flow over planar bare soil surface. Retardance due to

vegetation is greater than that due to soil. Density of vegetation affects flow resistance.

4 -

UNITED STATES WATERWAYS EXPERIMENTAL STATION 1956

Hydraulic capacity of meandering channels in straight floodways

1 Experimental, compound, smooth, rough, meander

2 To identify factors affecting flood channel capacity, specifically radius of curvature of bends, sinuosity of channels, depth of overbank flow, ratio of overbank area to channel area, overbank roughness

3 If channel narrow compared to floodplain, effect of channel sinuosity on conveyance of channel and floodplain is small. Effect of larger channel width in reduced floodplain is more critical. When floodplain width exceeds meander belt width by 300% effect of channel sinuosity on channel and floodplain conveyance is small. Channel discharge reduces with increased sinuosity.

4 Piezometers

USLU 1974

Calibration of roughness parameters for mathematical models of rivers with floodplains using dynamic programming

1 Theoretical, prototype, rough, compound, bend

2 To develop a mathematical model to simulate flows in channels with floodplains

3 Flow computation calibrated in respect of roughness coefficients. Variables in one dimensional flow exhibit sequential dependencies and a dynamic programming approach has been used to determine optimum roughness coefficient. River divided into sub reaches, roughness

coefficient determined for channel and floodplain in each reach as a function of steady state flow. Objective function of the optimisation process defined as sum of squares of the deviations between measured and calculated water surface profiles

4 -

UTAMI, UENO 1984

Visualization and picture processing of turbulent flow

1 Experimental, simple, smooth

2 To visualize the three dimensional structure of turbulent open channel flow using tracer material

3 Flow patterns in horizontal cross sections taken successively, digitized and processed by computer. Results produced include distribution of velocity vectors in horizontal cross sections, pattern of streamlines, distribution of rotation, distribution of two dimensional divergence, distribution of velocity vectors in longitudinal and transversal cross sections

4 Camera

VARSHNEY, GARDE 1975

Shear distribution in bends in rectangular channels

1 Simple, rough, theoretical, experimental, bend

2 To determine the magnitude of maximum local shear in rigid bends

3 Velocity distribution near bend exit follows forced vortex law; shear ratio at outside of exit bend dependent on channel width, depth and radius ratios as well as Reynolds no

4 Preston tube

VEDULA, ACHANTA 1985

Bed shear from velocity profiles: a new approach

1 Theoretical, simple, pipe, smooth, rough

2 To propose a general law of velocity distribution for the wall and flow core in respect of flat plates, pipes and open channels

3 A new binary law of velocity distribution is presented which is applicable to pipe and open channel flow. Using the inverse of the von Karman constant a procedure is evolved to estimate the bed shear in open channels or pipes

4 -

VREUGDENHIL, WIJBENGA 1982

Computation of flow patterns in rivers

1 Compound, rough, theoretical, experimental

2 To develop a finite difference method for computing flow patterns in rivers with verification from physical model data

3 Lateral diffusion of momentum has an appreciable effect on velocity distribution; relatively little known about viscosity and bottom roughness in field conditions so it is necessary to have accurate field measurements of velocities and water levels to allow calibration of both parameters. Research necessary to understand role of viscosity

4 Point gauges, min current meter

de VRIEND 1972

Theory of viscous flow in curved shallow channels

1 Theoretical, smooth, simple, bend

2 To consider the viscous axisymmetrical curved flow in an open channel with a constant rectangular cross section and a fixed horizontal bed.

3 Asymptotic expansion method is applicable to the problem of viscous curved flow in a shallow, rectangular open channel. Most intensive flow is situated within a few times the depth of flow from the inner wall. Secondary flow decreases main flow velocity near inner wall and increases velocity in rest of cross section. For large aspect ratio channels region of central axis flow not dependent upon side wall friction. This being the case then matched asymptotic expansions can be applied to the problem

4 -

de VRIEND 1976

A mathematical model of steady flow in curved open shallow channels

1 Theoretical, experimental, smooth, rough, simple, bend

2 Application of secondary flow theories to non axisymmetrical flows and and combination of theory with depth averaged computation methods for large aspect ratio channels

3 Model assumes shear stress is related to strain by coefficient of turbulence viscosity. Away from the banks vertical velocity gradients dominate horizontal gradients. Shear stress dominates inertial(advective) effects. Secondary flow plane is not perpendicular to streamwise direction. Transverse bed shear stress arises from secondary flow, direction dependent upon strength of main flow. Secondary bed shear stress has minor effect on depth averaged value of bed shear stress.

4 -

de VRIEND 1981

1 Steady flow in shallow channel bends - Parts 1 and 2

2 To analyse steady flow in curved channels physically and mathematically and to develop a computational method.

3 Convective influence of secondary flow in a bend can redistribute flow. In steep banked channels lateral diffusion is important in redistributing flow. Lateral interaction in curved channel much stronger than in straight channel. Implications - simplified computational methods only hold for very mildly curved flow. In other channels secondary flow should be taken into account.

Curved flow experiments in narrow channels not suited to represent flow in large natural river bends. Distorted hydraulic river models affect secondary flow.

4 -

de VRIEND, GELDOF 1983

Main flow velocity in short and sharply curved river bends

1 Prototype, theoretical, simple, rough

2 To compare measured and computed velocity fields and investigate influence of stage on main flow pattern. Velocity distribution analyzed using mathematical model of steady flows in shallow channels

3 Mathematical models predict flows well if secondary convection ignored. If included erroneous results due to strict assumption of similarity between main and secondary flow. At entry to bend inward skewing of velocity distribution due to flow inertia plus transverse surface slope. Position of velocity maximum downstream of bend represents retarded adaptation to bed not influence of secondary

flow. Secondary flow convection hampers outward skewing of flow. Increasing stage leads to shift of maximum velocity to inner bend of bank due to reduced asymmetry.

4 Current meter

de VRIEND, STRUIKSMA 1983

Flow and bed deformation in river bends

1 Theoretical, experimental, rough, bend, simple

2 To understand flow phenomena and to predict them with mathematical model, understand and model sediment transport processes; to model interaction between flow and bed deformation

3 Essential to model the main flow inertia, transverse sediment transport component and bottom shear stress due to secondary flow. Effect of streamwise accelerations and secondary flow convection on main velocity profile has minimal influence on main flow field, does however influence bottom shear stress. Intensity of secondary flow retarded in respect of source. Bottom shear stress reacts quicker to source than intensity

4 Miniature current meter

WAGNER 1969

Laminar flow in open rectangular channels

1 Simple, theoretical

2 To develop computational program to predict flow characteristics with laminar flow in rectangular channels

3 Dependency of wall and bed shear on aspect ratio indicated

4 -

WALLACE, BRODKEY, ECKELMANN 1977

Pattern recognized structures in bounded turbulent shear flows

1 Simple, smooth, experimental

2 Using pattern recognition technique for analysing turbulent velocity signals in order to detect and describe the velocity signal signatures of coherent structures in fully developed turbulent channel flow

3 Simple wave forms producing wall region Reynolds stress identified; x and y patterns are 180° out of phase; 65% of total signal in region of high Reynolds stress contains recognized pattern

4 Hot film anemometer

WALLIS, KNIGHT 1984

Calibration studies concerning a one dimensional numerical tidal model with particular reference to resistance coefficients.

1 Theoretical

2 A reassesment of calibration procedure to improve understanding of behaviour of flow resistance in tidal channels using a numerical tidal model of Conwy estuary.

3 Resistance coefficients show 3 main trends - decreasing with increasing stage, a flow directional dependence due to flood or ebb dominated bed forms, and a high variability with location along the estuary, especially where sand banks are exposed at low water.

4 -

WATTS, SIMONS, RICHARDSON 1967

Variation of alpha and beta values in a lined open channel

1 Experimental, simple, smooth

2 To study the magnitude of the kinetic energy flux and momentum flux coefficients in channel reaches adjacent to and within sharp bends

3 Constant values determined for alpha and beta

Discussion by Mavis and Apmann, Cobb and Powell. Closure by Watts, Simons and Richardson.

4 Current meters

WEISS, MIDGLEY 1978

Suite of mathematical flood plain models

1 Theoretical, prototype, rough, compound

2 To simulate on a time scale the rise and fall of flood waters, the flow velocities and the degree of scour or sediment deposition at any part of the flood plain during events covering a wide range of severity. The modelling technique is demonstrated with reference to the Mfolozi flood plain in South Africa.

3 Compendium of related mathematical models developed to facilitate flood plain management. Given the discharge hydrograph of a flood at entry to a floodplain, one can, with the aid of topographic and hydraulic models, generate the time graphs of depth of flow and of the average velocity vector of any elemental area of the flood plain. With these one can determine the depth and duration of inundation, the approximate extent of erosion or sediment deposition, and the degree of violence of the floodwaters anywhere on the flood plain.

4 -

WHITE, WHITEHEAD 1971

The performance of piezometric tappings

1 Experimental, simple, smooth, rough, duct

2 To investigate the errors that arise in the measurement of head

3 The form and value of the relationship between the error at a piezometric tapping set in a smooth wall and the local boundary flow are broadly in line with other researchers. Indication that error is some function of hole diameter. Holes in duralumin and stainless steel showed almost identical displacement. Damage inside the tapping has no effect on readings whilst scoring around the tapping hole produces very variable results.

4 Preston tube

WOERNER, JONES, FENZL 1968

Laminar flow in finitely wide rectangular channels

1 Experimental, theoretical, simple, smooth

2 To determine the effects of side walls on the laminar velocity distribution and to determine the change in friction factors with Reynold`s numbers and width to depth ratios in smooth, open, rectangular channels

3 Centreline velocity distribution of channels with width to depth ratios > 10 to 1 is identical with the velocity distribution in an infinitely wide channel. Confirmation of Boussinesq solution of Poisson`s equation for the average velocity of two dimensional laminar flow in smooth, open, rectangular channels with width to depth ratios between 2.74 and 100 to 1. Velocity distribution measurements indicate errors associated with surface tension and air tension are negligible. Lower critical Reynold`s number in smooth rectangular channels is 800 independent of width depth ratio when the correction for side wall effects is made. Friction factors and Reynold`s numbers for laminar flow can be transformed into values corresponding to those that would occur in an infinitely wide channel independent of width to depth ratio.

4 Volumetric tank, piezometric tappings, point gauges, pitot tube, floats

WORMLEATON, ALLEN, HADJIPANOS 1980

The effects of the spacing of hemispherical elements on the hydraulic resistance of open channels

1 Simple, smooth, rough, experimental

2 To determine the effect of roughness spacing on flow resistance equations

3 Exponents relating to hydraulic radius and slope vary with increasing boundary roughness, exponent on R increases with roughness, exponent on S varies with no related pattern. Roughness parameter relating to height and spacing of roughness elements applies over full range of roughness conditions. Tests essentially in transitional flow region, experimental results fit Colebrook White pipe flow transition law

4 Point gauge, volumetric tank, adj weir

WORMLEATON, ALLEN, HADJIPANOS 1982

Discharge assessment in compound channel flow

1 Compound, rough, experimental

2 Experimental tests with compound channels using differing floodplain roughness to provide data to allow assessment of apparent shear stresses at several different assumed interface planes

3 Conventional discharge assessment methods make assumptions in respect of apparent shear stress that can lead to inaccurate discharge computation. Apparent shear acting on vertical interface planes is strongly related to velocity difference between subdivisions, depth ratio and width ratio. At low floodplain depths apparent shear across across vertical interface higher than main channel shear, also

increases with increasing floodplain roughness. Stress reduced with increasing depth. Apparent shear reduced if horizontal interface used giving more accurate representation of discharge ratios, accuracy varies dependent upon inclusion or not of shear interface as representing wetted perimeter

4 Preston tube, Dall tube, point gauge, adj weir, manometer

WORMLEATON, ALLEN, HADJIPANOS 1983

Discharge assessment in compound channel flow
Closure

WORMLEATON, ALLEN, HADJIPANOS 1980

Interaction between main channel and flood plain flows
Discussion of paper by Rajaratnam, Ahmadi 1979

WORMLEATON, HADJIPANOS 1985

Flow distribution in compound channels

1 Compound, rough, experimental

2 To investigate discharges through main channel and floodplain divisions

3 Results indicate that though overall discharge computation may be correct for overall flow section, incorrect assessment of subdivision discharges leads to inaccuracy in momentum and energy flux and consequently the application of dynamic flow equations

4 Min current meter, Dall tube, point gauge, adj weir

WRIGHT, CARSTENS 1970

Linear momentum flux to overbank sections

1 Compound, smooth, experimental, duct

2 To determine the tangential force on the interface between channel and floodplain flows

3 Apparent shear stress at interface of similar magnitude to shear stress in main channel. In respect of discharge computation main channel and interface taken as a unit for computing mean boundary shear stress; mean boundary shear stress used to to compute apparent shear force; apparent shear force used as propulsive force for minor channel

4 Preston tube, pressure tappings, pitot tube, transducer, manometer

YEN, HO 1983

Discharge assessment in compound channel flow
Discussion of paper by Wormleaton, Allen, Hadjipanos 1982

YEN, HO 1985

Flood plain and main channel flow interaction
Discussion of paper by Knight, Demetriou 1983

YEN, OVERTON 1973

Shape effects on resistance in floodplain channels

1 Compound, smooth, rough, theoretical, experimental

2 To determine lines of zero shear stress

3 Considered analogy exists between laminar and turbulent flow boundary geometry based on dimensional analysis. Zero shear stress lines incline to channel centre from floodplain, angle dependent upon stage. Mannings n from experimental data considered to take account of channel geometry and boundary roughness

4 -

YEN, YEN 1971

Water surface configuration in channel bends

1 Simple, smooth, rough, theoretical, experimental

2 To illustrate using the equations of motion the influence of helical motion and channel bed topography on water surface profile and superelevation

3 Mathematical expressions derived for longitudinal and transversal water surface slopes. Transversal slope and profile and consequently superelevation can be predicted using the mathematical expressions provided longitudinal and transversal velocity components are known. Results indicate that channel cross section shape and helical motion are important in determining water surface profile

4 -

YOON, LEE, LEE 1986

Flow characteristics in shallow channel bends

1 Theory, experimental, simple, smooth, bend

2 To present and validate a numerical model composed of the mass and momentum equations for two dimensional unsteady flow in bends using an implicit finite difference method on a staggered grid system.

3 Good agreement derived from comparing computed data on depth, velocity and direction of flow in bends with data from laboratory flumes.

4 -

ZHELEZNYAKOV 1965

Relative deficit of mean velocity of unstable river flow, kinematic effect in river beds with floodplains

1 Compound, rough, experimental

2 To investigate the kinematic effect in rivers with floodplains

3 Local velocities and mean velocity of main channel flow decrease with onset of floodplain flow. At a certain floodplain depth velocities then continue to increase. This critical depth increases with channel/floodplain width ratio.

Increasing the floodplain roughness relative to channel roughness reduces the channel velocity. Channel/floodplain depth considered in its inverse form to represent river bed capacity, capacity varies with channel/floodplain width ratio

4 -

ZHELEZNYAKOV 1971

Interaction of channel and floodplain streams

1 Compound, rough, experimental

2 Characteristics of kinematic effect

3 Conclusions as for 1965 paper

4 -

ZHELEZNYAKOV, NOVIKOVA 1973

Kinematic effect of the flow in erodible channels

1 Compound, rough, experimental

2 Investigation of the kinematic effect on channels with erodible beds

3 Kinematic effect better developed in erodible channels than in rigid channels. In unsteady river flow the kinematic effect can exhibit a hysteresis form. The kinematic effect has an eddy form of specific frequency.

4 Thermohydrometer, transducer

5 GEOMETRIC PARAMETERS

This file detailing the dimensions of the channels studied in investigations relating to flow in open channels, ducts and pipes was compiled on the Apricot Xi-10 micro computer using Wordstar 3.40 supplied by Micro Pro.

All dimensions have been unified in S.1 units to enable comparison between individual research work.

The data is presented in three lines representing the flume dimensions, the channel dimensions and three dimensionless parameters that are considered to be representative of the channel form.

The flume dimensions enable an assessment of the size of research facility used in any particular work study and are essentially restricted to experimental facilities. Channel dimensions can relate to experimental, prototypical or theoretical investigations.

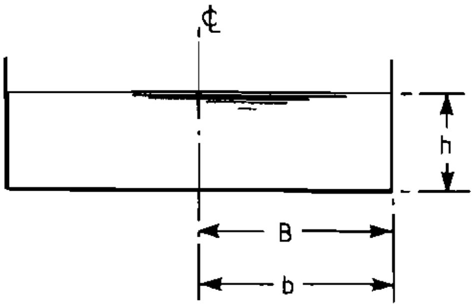
In respect of rectangular flumes or ducts the channel dimensions, with the possible exception of the length, are the same as the flume dimensions.

In respect of compound channels, the channel dimensions with the possible exception of the length, will essentially be different than the flume dimensions, as the width and depth of channel refer to the incised channel within the berms or flood plains.

Data referable to prototype research will only be found in the lines relating to channel dimensions and dimensionless parameters.

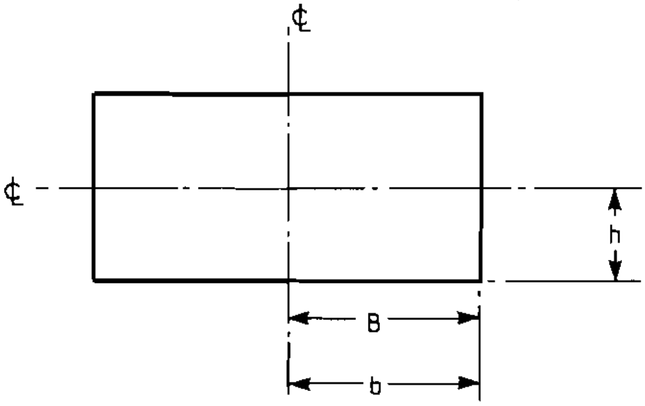
The notation used in defining the dimensionless parameters is illustrated in the diagrams a, b and c.

(a) Rectangular flume, simple channel



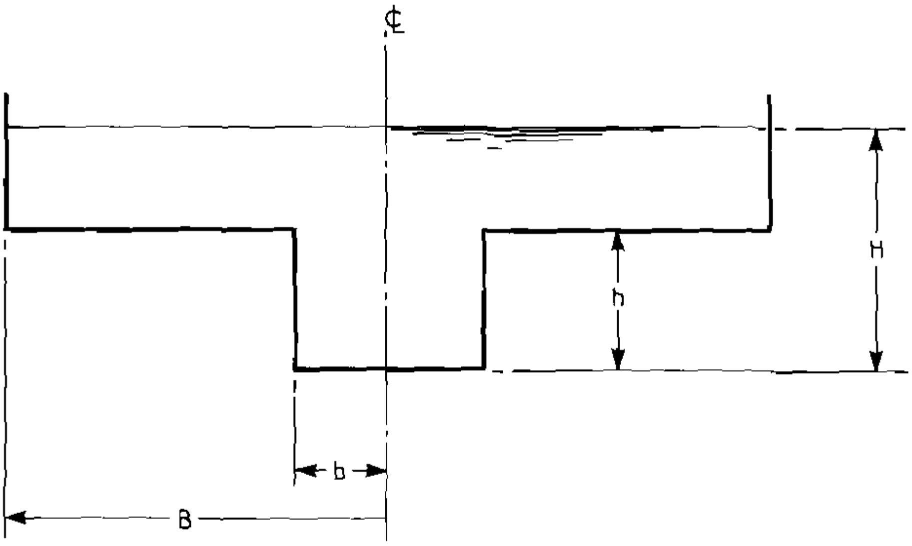
ie B/b = 1; H-h/H not applicable; b/h dependent upon flow depth.

(b) Duct - rectangular



B/b = 1; H-h/H not applicable; b/h = constant.

(c) Compound channel or duct



B/b = constant; H-h/H dependent upon flow depth; b/h = constant.

Asymmetric compound channels or ducts are treated as if representing half a complete compound channel or duct and consequently the same dimensionless parameters apply.

In respect of all channels, b, represents half the base width of the channel whether it is rectangular or trapezoidal in section.

Geometric parameters

Dimensions in metres : L = Length; W = Width; D = Depth

Ratios:

B/b = Floodplain width/Channel width
H-h/H = Flow depth - Channel depth/Flow depth
b/h = Channel width/Channel depth

where B represents half the total Floodplain width in respect of a symmetrical compound channel and b represents half the main channel width, both being related to the main channel centreline, and h represents flow depth in case of rectangular channels and depth of channel below floodplain
for compound channels

AUTHOR	FLUME (M) L,W,D			SLOPE	DISCHARGE (Cumecs)
TITLE	CHANNEL (M) L,W,D				INSTRUMENTATION
PUBLICATION	CHANNEL RATIOS B/b,H-h/H,b/H				
ABRAHAM G, HOLLEY E R, SIEMONS J	-	-	-	-	250
SOME ASPECTS OF ANALYZING TRANSVERSE					
DIFFUSION IN RIVERS	1000	75	-		-
DELFT PUBLICATION NO 102, APRIL 1972					
	1	-	8.3		
ADACHI S	14.4	0.20	0.30	2(-3)	0.00015/0.015
ON THE ARTIFICIAL STRIP ROUGHNESS					
KYOTO UNIVERSITY,DISASTER PREVENTION	14.4	0.20	0.30		PIEZOMETRIC TAPPINGS
RESEARCH INSTITUTE, NO 69, MARCH 1964					
	1	-	0.82/0.92		
ALLEN J, CHEE S P	6.3/7.3	.146	-	0/1.22(-3)	-
THE RESISTANCE TO THE FLOW OF WATER					
ROUND A SMOOTH CIRCULAR BEND IN AN	1.4/5.1	.048/.146	-		POINT GAUGE
OPEN CHANNEL					VOLUMETRIC TANK
PICE, 1962, VOL 23, 1	1	-	.16/2.5		ADJ. WEIR

ALLEN J, ULLAH M I	6.096	.051	.381	-	-
THE FLOW OF WATER THROUGH SMOOTH OPEN					
CHANNELS OF NARROW RECTANGULAR AND T	6.096	.0254	.279		POINT GAUGE
SHAPED CROSS SECTIONS					MIN. CURRENT METER
PICE, 1967, 36, PAPER 6946, DECEMBER	1/2	.083/.203	.045		VOLUMETRIC TANK
					FLOATS
VAN ALPHEN J S L J,BLOKS P M,HOEKSTRA P	-	-	-	-	1.25
FLOW AND GRAINSIZE PATTERN IN A SHARPLY					
CURVED RIVER BEND	30	8	0.6		CURRENT METER
EARTH SURFACE PROCESSES,9,DEC,1984					ELECTRO MAGNETIC C.M.
	1	-	6.67		
ANWAR H O	100	1.50	0.78	-	-
LOW REYNOLDS NUMBER TURBULENT FLOW IN					
LABORATORY FLUME	100	1.50	0.78		MIN. CURRENT METER
PASCE, J ENG MECH, VOL 112, 1, JAN, 1986					ULTRASONIC C.M.
	1	-	1.875		
ANWAR H O	-	-	-	-	-
TURBULENT STRUCTURE IN A RIVER BEND					
PASCE, J HYD D, VOL 112, 8, AUG, 1986	12.5	3.0	-		E.M. CURRENT METER
	1	-	4.36/5.07		
ANWAR H O, ATKINS R	27	0.6	0.4	-	-
TURBULENT STRUCTURE IN AN OPEN CHANNEL					
FLOW	27	0.6	0.40		E.M. CURRENT METER
EUROMECH 156, ISTANBUL, JULY, 1982					MIN. CURRENT METER
	1	-	1.67		
ASANO T, HASHIMOTO H, FUJITA K	50	3	-	.94/1.07(-3)	0.0053/0.6129
CHARACTERISTICS OF VARIATION OF MANNINGS					
ROUGHNESS COEFFICIENT IN A COMPOUND CROSS	30	0.9/2.4	.031/.121		MIN. CURRENT METER
SECTION					POINT GAUGE
PROC. 21st CONG., IAHR, MELBOURNE, VOL 6,	1.2/3.3	.016/.668	4.96/15.2		
AUG, 1985					

ATKINS R	27	0.6	0.4	-	-
TURBULENCE MEASUREMENTS USING A SMALL					
ELECTROMAGNETIC CURRENT METER IN OPEN	27	0.6	0.4		E.M.CURRENT METER
CHANNELS					MIN. CURRENT METER
HYDRAULICS RESEARCH LTD, IT 196, 1980	1	-	1		PRESTON TUBE
BAIRD J I, ERVINE D A	8.5	0.8	0.3	3.33/10(-4)	0/0.06
RESISTANCE TO FLOW IN CHANNELS WITH					
OVERBANK FLOODPLAIN FLOW	8.5	0.2/0.6	.052/.152		PRESTON TUBE
PROC. 1st INT CONF ON CHANNELS AND CHANNEL					PITOT TUBE
CONTROL STRUCTURES, SOUTHAMPTON, 1984	1.33/4	-	1.32/7.69		POINT GAUGE
BARISHNIKOV N B, IVANOV G V, SOKOLOV Y N	10	2.4	-	-	0/0.09
ROLE OF FLOODPLAIN IN FLOOD DISCHARGE OF					
A RIVER CHANNEL	10	0.4	0.05		-
IAHR, 1971, PARIS, PROC 14 TH CONGRESS					
	6	0.39	1.429		
BARRAGE A	-	-	-	2.6(-3)	57.5
RESEARCH INTO TURBULENCE AND SUSPENDED					
SEDIMENT IN RIVERS	-	14	-		PRESSURE PROBE
INSTITUT FUR HYDROMECHANIK UND					
WASSERWIRTSCHAFT, ETH, ZURICH	1	-	3.56/6.48		
R 15 - 79, MARCH, 1979					
BATHURST J C	-	-	-	.80/1.74(-2)	0.9/7.2
FLOW RESISTANCE OF LARGE SCALE ROUGHNESS					
PASCE, J HYD D, VOL 104, HY12, DEC, 1978	100	14.9/32.9	-		CURRENT METER
	1	-	24/65		
BATHURST J C	-	-	-	.01/2.9(-3)	0.76/36.76
DISTRIBUTION OF BOUNDARY SHEAR STRESS					
ADJUSTMENTS OF THE FLUVIAL SYSTEM, 1979	38/76	8.4/31.9	-		CURRENT METER
	1	-	10.3/51.2		

BATHURST J C, THORNE C R, HEY R D	-	-	-	-	1.1/9
DIRECT MEASUREMENTS OF SECONDARY CURRENTS					
IN RIVER BENDS	-	8/21	-		E.M. CURRENT METER
NATURE, 269, OCTOBER, 1977					
	1	-	5.3/10		
BATHURST J C, THORNE C R, HEY R D	-	-	-	.470/2.9(-3)	.92/15.48
SECONDARY FLOW AND SHEAR STRESS AT					
RIVER BENDS	-	8.4/26.2	-		E.M. FLOWMETER
PASCE, J HYD D, VOL 105, HY10, OCT, 1979					
	1	-	5.93/25.44		
BATHURST J C, LI R M, SIMONS D B	9.54	1.168	-	2/8(-2)	.00143/.08020
RESISTANCE EQUATION FOR LARGE SCALE					
ROUGHNESS	9.54	1.168	-		POINT GAUGE
PASCE, J HYD D, VOL 107, HY12, DEC, 1981					
	1	-	6.5/77		
BERTRAM H U	12	1.24	0.37	5/20(-4)	0.080
FLOW IN TRAPEZOIDAL CHANNELS WITH EXTREME					
BANK ROUGHNESS	12	0.4	0.37		POINT GAUGE
LEICHTWEISS INSTITUT FUR WASSERBAU					PITOT TUBE
NO 86, 1985	1	-	0.33/1		VENTURI
					WEIR
					MIN. CURRENT METER
BHOWMIK N G, DEMISSIE M	-	-	-	-	417/1774
CARRYING CAPACITY OF FLOODPLAINS					
PASCE, J HYD D, VOL 108, HY3, MARCH, 1982	-	60/90	4.5/9		
	5/72	.17/.4	5/8		
BLALOCK M E, STURM T W	24.38	1.067	0.457	1/4.5(-3)	0.046/0.050
MINIMUM SPECIFIC ENERGY IN COMPOUND OPEN					
CHANNEL	24.38	.296	0.162		PITOT TUBE
PASCE, J HYD D, VOL 107, HY6, JUNE, 1981					PRESSURE TRANSDUCER
	3.58	0.06/0.18	1.827		VENTURI METER

BLINCO P H, PARTHENIADES E	7.315	0.305	0.457	0/3(-2)	0.0009/0.014
TURBULENCE CHARACTERISTICS IN FREE SURFACE					
FLOWS OVER SMOOTH AND ROUGH BOUNDARIES	7.315	0.305	0.457		HOT FILM ANEMOMETER
J HYDRAULIC RESEARCH, 9, 1971, 1					
	1	-	1.25/6.25		
de BRAY B G	6.4	1.524	.31/1.524	-	AIR
SOME INVESTIGATIONS INTO THE SPANWISE					
NON UNIFORMITY OF NOMINALLY TWO DIMENSIONAL	3.048	1.524	0.3048		PRESTON TUBE
INCOMPRESSIBLE BOUNDARY LAYERS DOWNSTREAM					STATIC TUBE
OF GAUZE SCREENS					
AERONAUTICAL RESEARCH COUNCIL, NO 3578, 1967	1	-	5		
BROWN K C, JOUBERT P N	-	0.343	0.254	-	AIR
THE MEASUREMENT OF SKIN FRICTION IN					
TURBULENT BOUNDARY LAYERS WITH ADVERSE	-	0.343	0.254		SHEAR STRESS METER
PRESSURE GRADIENTS					PRESTON TUBE
J FLUID MECHANICS, VOL 35, 4, MARCH, 1969	1	-	1.35		STATIC TUBE
BRUNDRETT E, BAINES W D	21.34	0.076	0.076	-	AIR
THE PRODUCTION AND DIFFUSION OF VORTICITY					
IN DUCT FLOW	21.34	0.076	0.076		HOT WIRE ANEMOMETER
J FLUID MECH, 1964, VOL 19, 3					
	1	-	1		
BUCHANAN R W	-	-	-	-	-
DISCHARGE ASSESSMENT IN COMPOUND CHANNEL					
FLOW (DISCUSSION)	-	-	-		-
PASCE, J HYD D, VOL 109, HY11, NOV, 1983					
	1.1/2.7	-	-		
BUTLER D, ROCK S P, WEST J R	-	-	-	7.2(-3)	0.05/4.0
FRICTION COEFFICIENT VARIATION WITH FLOW					
IN AN URBAN STREAM	47/91	4/5.5	-		CURRENT METER
J INSTITUTE WATER ENGINEERS & SCIENTISTS					STAFF GAUGES
VOL 32, 3, 1978	1	-	-		

CARLSON L N, IRVINE T F FULLY DEVELOPED PRESSURE DROP IN TRIANGULAR SHAPED DUCTS J HEAT TRANSFER, ASME, 60, NOV, 1961	3.658	.004/.027D	-	-	AIR
	1.829	.004/.027D	-		PIEZOMETRIC TAPPINGS
	-	-	-		
CHIU C L, CHIOU J D STRUCTURE OF 3-D FLOW IN RECTANGULAR OPEN CHANNELS PASCE, J HYD D, VOL 112, NO 11, NOV, 1986	-	0.845/6.1	-	5/38(-4)	0.04/101
	-	0.845/6.1	-		-
	1	-	.5/10		
CHIU C L, HSIUNG D E, LIN H C THREE DIMENSIONAL OPEN CHANNEL FLOW PASCE, J HYD D,VOL 104, HY8, AUG, 1978	-	-	-	-	17.84/35.97
	1829	19.8/20.4	-		-
	1	-	8.57/13.81		
CHIU C L, HSIUNG D E SECONDARY FLOW,SHEAR STRESS AND SEDIMENT TRANSPORT PASCE, J HYD D, VOL 107, HY7, JULY, 1981	-	-	-	-	17.84/36.25
	610	20.1/20.4	-		-
	1	-	9.08/13.81		
CHIU C L, LIN H C, MIZUMURA K SIMULATION OF HYDRAULIC PROCESSES IN OPEN CHANNELS PASCE, J HYD D, VOL 102, HY2, FEB, 1976	-	-	-	-	-
	-	18.24	-		-
	1	-	5.59/14.5		
CHIU C L, LIN G F COMPUTATION OF THREE DIMENSIONAL FLOW AND SHEAR IN OPEN CHANNELS PASCE, J HYD D, VOL 109, 11, OCT, 1982	31	1.83	.183	-	0.29
	31	1.83	.183		PRESTON TUBE
	1	-	5		

CHOUDARY U K, NARASIMHAN S	24.29	.96	.25	-	-
FLOW IN 180 DEGREE OPEN CHANNEL RIGID					
BOUNDARY BENDS	24.29	.96	.25		PRESTON TUBE
PASCE, J HYD D, VOL 103, HY6, JUNE, 1977					PITOT TUBE
	1	-	2.5/5		POINT GAUGE
CLAUSER F H	11.28	1.219	.914	-	AIR
TURBULENT BOUNDARY LAYERS IN ADVERSE					
PRESSURE GRADIENTS	2.743	1.219	.914		PITOT TUBE
J AERONAUTICAL SCIENCES, FEB, 1954					HOT WIRE ANEMOMETER
	1	-	1.33		
COLEBROOK C F, WHITE C M	6.79	0.0535D	-	-	AIR
EXPERIMENTS WITH FLUID FRICTION IN					
ROUGHENED PIPES	2.675	0.0535D	-		PIEZOMETRIC TAPPING
PROC ROYAL SOC LONDON, A 906, VOL 161,					
AUGUST 1937	-	-	-		
CRUFF R W	24.38	1.067	0.457	-	-
CROSS CHANNEL TRANSFER OF LINEAR MOMENTUM					
IN SMOOTH RECTANGULAR CHANNELS	24.38	.610	.122		PITOT TUBE
UNITED STATES GEOLOGICAL SURVEY WATER					PIEZOMETRIC TAPPINGS
SUPPLY PAPER 1592 - B	1	-	2.36/19		POINT GAUGES
					ORIFICE METER
					VENTURI
DAS B P, TOWNSEND R D	18.3	2.3	1.2	-	0/0.085
SHEAR STRESS DISTRIBUTION AT CHANNEL					
CONSTRICTIONS	9.2	.18/1.72	0.034		POINT GAUGE
PASCE, J HYD D, VOL 107, HY12, DEC, 1981					MIN. CURRENT METER
	1.3/12.5	.306/.469	0.79/12.5		BED PROBE
DAVIDIAN J, CAHAL D I	42.67	0.457	-	-	-
DISTRIBUTION OF SHEAR IN RECTANGULAR					
CHANNELS	42.67	0.457	-		PRESTON TUBE
U.S. GEOLOGICAL SURVEY, PAPER 475 C,					
ART 113, 1963	1	-	1.1/1.8		

DAVIES S J, WHITE C M	-	0.0254	.0154/.0681	-	2.294/8.308 -6
AN EXPERIMENTAL STUDY OF THE FLOW OF WATER					
IN PIPES OF RECTANGULAR SECTION	0.0381	0.0254	.0154/.0681		PIEZOMETRIC TAPPING
PROC ROY SOC, VOL 3, 2, FEB, 1923					
	1	-	.186/.825		
DELLEUR J W, TOEBES G H, UDEOZO B C	27.43	.91/1.83	.49/.73	6.7/37.8(-4)	0.067/0.315
UNIFORM FLOW IN IDEALIZED CHANNEL					
FLOODPLAIN GEOMETRIES	27.43	0.283	.18/.427		PRANDTL TUBE
IAHR, 1967, FORT COLLINS, 12 TH CONG.					PRESSURE TRANSDUCER
	3.2/6.5	.1/.36	.33/.78		POINT GAUGES
DELLEUR J W	4.76	.348	-	-	-
THE BOUNDARY LAYER DEVELOPMENT IN					
OPEN CHANNELS	4.76	.348	-		PITOT TUBE
PASCE, J EM D, VOL 83, EM1, JAN, 1957					
	1	-	1.245/3.925		
EINSTEIN H A, BANKS R B	5.18	.305	.457	7.3/10.2(-3)	-
FLUID RESISTANCE OF COMPOSITE ROUGHNESS					
TRANS AMER GEOPHYS UNION, VOL 31, 4,	5.18	.305	.457		POINT GAUGES
AUG, 1950					
	1	-	1.333/2.146		
EINSTEIN H A, BARBAROSSA N L	-	-	-	1.49/17.2(-4)	0.59/4106
RIVER CHANNEL ROUGHNESS					
TASCE, VOL 117, 1952	1/57 KM	34/914	.137/4.08		-
	1	-	6.86/322		
EINSTEIN H A, HARDER J A	-	.406	.102	-	-
VELOCITY DISTRIBUTION AND THE BOUNDARY					
LAYER AT CHANNEL BENDS	-	.406	.102		FLOATS
TRANS AMER GEOPHYS UNION, VOL 35, 1,					
FEB, 1954	1	-	2.45/6.06		

EINSTEIN H A, LI H	-	-	-	-	-
SECONDARY CURRENTS IN STRAIGHT CHANNELS					
TRANS AMER GEOPHYS UNION, VOL 39, 6,	-	-	-		-
DEC, 1958					
	1	-	-		
ELLIS L B, JOUBERT P N	-	0.838	0.064	-	AIR
TURBULENT SHEAR FLOW IN A CURVED DUCT					
J FLUID MECH, 1974, VOL 62, PART 1	-	0.838	0.064		PRESSURE TAPPINGS
					TOTAL HEAD PROBE
	1	-	13		CLAUSER CHART
ELSAWY E M, CRORY P M	9.144	0.61	-	2.645(-4)	-
EFFECTS OF INTERACTION ON A CHANNEL WITH					
ONE FLOODPLAIN	9.144	.254	0.102		LASER DOPPLER ANEMOMETER
INT. CONF. WATER REOURCES ENG., BANGKOK,					
1978	2.4	.021/.45	2.5		
ELSAWY E M, McKEE M P, McKEOGH E J	9.15	0.61	-	2.63(-4)	0.001/0.02
APPLICATION OF LDA TECHNIQUES TO VELOCITY					
AND TURBULENCE MEASUREMENTS IN OPEN	9.15	.101/.254	.102		LASER DOPPLER
CHANNEL OF COMPOUND CROSS SECTION					ANEMOMETER
IAHR, MOSCOW, 1983, VOL 3, SEPT, 20 TH CONG	2.4/6	.335/.342	0.99/2.49		
ENGELUND F	5.65	0.2	-	-	-
INSTABILITY OF FLOW IN A CURVED					
ALLUVIAL CHANNEL	5.65	0.2	-		POINT GAUGE
J FLUID MECH, 1975, VOL 72, 1					
	1	-	1.66/2.5		
FARBER K	4.75	0.4	0.42	-	-
DETERMINATION OF TURBULENCE PARAMETERS					
IN OPEN CHANNEL FLOW WITH A LASER DOPPLER	4.75	0.4	0.42		LASER DOPPLER ANEMOMETER
ANEMOMETER AND PITOT TUBE					PITOT TUBE
INSTITUT FUR WASSERWESEN, HOCHSCHULE DER	1	-	0.6		
BUNDESWEHR, MUNCHEN, 14, 1985					

FRANCIS J R D, ASFARI A F	13.57	.61	-	-	0.00275/0.0044
VELOCITY DISTRIBUTIONS IN WIDE,CURVED					
OPEN CHANNEL FLOWS	13/14	.255/.61	-		MIN CURRENT METER
J HYDRAULIC RESEARCH, 9, 1, 1971					
	1	-	1.68/4		
FUKUOKA S, KIM S, EGUCHI S	23	0.3	-	1.25(-3)	0.00657
STRUCTURES OF THE MEAN FLOW IN MEANDERING					
CHANNELS WITH ASYMMETRIC CONTINUOUS BENDS	3	0.3	-	-	PITOT TUBE
5TH CONG., IAHR, ASIAN & PACIFIC REG. DIV.,					
AUGUST, 1986	1	-	2.88		
FUTIAN L	5	0.10	0.15	-	0.0011/0.00116
THE TURBULENT STRUCTURE OF CHANNEL FLOW					
WITH SUSPENDED SEDIMENT	5	0.10	0.15		LASER DOPPLER VELOCIMETER
J SEDIMENT RESEARCH, 1, 1986, BEIJING					
	1	-	1.37		
GADDINI B, MORGANTI M	5	.31	.29	1.06(-3)	-
TURBULENT SHEAR STRESSES AND VELOCITY					
DISTRIBUTION IN OPEN CHANNEL FLOWS	5	.31	.29		HOT FILM ANEMOMETER
LA HOUILLE BLANCHE, 4, 1982					
	1	-	1.48		
GERARD R, BAINES W D	14.4	0.0178R	-	-	AIR
TURBULENT FLOW IN VERY NONCIRCULAR CONDUIT	3	0.0036R	-		
PASCE, J HYD D, VOL 103, HY8, AUG, 1977					
	6.1	0.0178R	-		PIEZOMETRIC TAPPINGS
	3	0.0036R	-		PRESTON TUBE
	1	-	-		
GESSNER F B	24	.254	.254	-	AIR
THE ORIGIN OF SECONDARY FLOW IN					
TURBULENT FLOW ALONG A CORNER	24	.254	.254		HOT WIRE ANEMOMETER
J FLUID MECH, 1973, VOL 58, 1					PRESSURE TAPPINGS
	1	-	1		MICROMANOMETER

GESSNER F B, EMERY A F	22	0.254	0.254	-	AIR
THE NUMERICAL PREDICTION OF DEVELOPING					
TURBULENT FLOW IN RECTANGULAR DUCTS	22	0.254	0.254		PIEZOMETERS
J FLUIDS ENGINEERING, TASME, VOL 103,					PRESTON TUBE
SEPTEMBER, 1981	1	-	1		HOT WIRE ANEMOMETER
					KIEL TUBE
GESSNER F B, JONES J B	9	.203	.203	-	AIR
ON SOME ASPECTS OF FULLY DEVELOPED					
TURBULENT FLOW IN RECTANGULAR CHANNELS	9	.203	.102/.203		HOT WIRE ANEMOMETER
J FLUID MECH, 1965, VOL 23, 4					PITOT TUBE
	1	-	1/2		PRESSURE TAPPINGS
GHOSH S N	15.55	.914	-	3.02(-3)	0.014/0.026
BOUNDARY SHEAR DISTRIBUTION IN CHANNELS					
WITH VARYING WALL ROUGHNESS	13.41	.20	-		PRESTON TUBE
PICE, VOL 53, 7572, DECEMBER, 1972					PITOT TUBE
	1	-	0.58/0.96		DRAG BALANCE
					V - NOTCH
					MANOMETER
GHOSH S, JENA S B	9.144	.61	.61	5.25(-3)	0.026/0.057
BOUNDARY SHEAR DISTRIBUTION IN OPEN					
CHANNEL COMPOUND	8.534	.20	.1		PRESTON TUBE
PICE, VOL 49, 7404, AUGUST, 1971					PITOT TUBE
	1.75	.17/.43	1		VOLUMETRIC TANK
GHOSH S N, KAR S K	10	0.600	-	6.1(-4)	-
RIVER FLOODPLAIN INTERACTION AND					
DISTRIBUTION OF BOUNDARY SHEAR STRESS	10	.1	0.1		PITOT TUBE
IN A MEANDER CHANNEL WITH FLOODPLAIN					MANOMETER
PICE, 1975, PART 2, 59, DECEMBER	3.5/5.3	.38/.39	.5/.745		
GHOSH S N, MEHTA P A	-	-	-	-	-
BOUNDARY SHEAR DISTRIBUTION IN A					
COMPOUND CHANNEL WITH VARYING	-	.20	.1		PRESTON TUBE
ROUGHNESS DISTRIBUTION					PITOT TUBE
PICE, VOL 57, TN-91, MARCH, 1974	1.75	.63/.67	1		VOLUMETRIC TANK

GHOSH S N, ROY N	15.55	.914	-	3.02(-3)	0.005/0.033
BOUNDARY SHEAR DISTRIBUTION IN					
OPEN CHANNEL FLOW	13.41	.20	-		PRESTON TUBE
PASCE, J HYD D, VOL 96, HY4, 7241,					DRAG BALANCE
APRIL, 1970	1	-	.57/2.04		V NOTCH
					MANOMETER
GORDIENKO P I	8	0.4/1.5	-	2.07/164(-3)	-
THE INFLUENCE OF CHANNEL ROUGHNESS AND FLOW					
STATES ON HYDRAULIC RESISTANCES OF TURBULENT	8	0.4/1.5	-		-
FLOW					
J HYD RESEARCH, 5, 1967, 4	1	-	-		
GOTTLIEB L	18	2	-	-	0.065/0.075
THREE DIMENSIONAL FLOW PATTERN AND BED					
TOPOGRAPHY IN MEANDERING CHANNELS	12	1	-		MIN. CURRENT METER
TECHNICAL UNIVERSITY OF DENMARK,11,FEB,1976					VELOCITY VECTOR PROBE
	1	-	2.18/3.65		
GRASS A J	10	0.25	-	-	-
STRUCTURAL FEATURES OF TURBULENT FLOW					
OVER SMOOTH AND ROUGH BOUNDARIES	10	0.25	-		MIN. CURRENT METER
J FLUID MECH., VOL 50, 2, 1971					POINT GAUGE
	1	-	2.5		
GRIJSEN J G,MEIJER Th G P	-	-	-	-	5000/40000
ON THE MODELLING OF FLOODFLOW IN LARGE					
RIVER SYSTEMS WITH FLOODPLAINS	1700	-	-	-	
DELFT HYDRAULICS LABORA					
	-	-	-		
HARTNETT J P, KOH J C Y, McCOMAS S T	3.658	.014/.079	.008/.014	-	AIR
A COMPARISON OF PREDICTED AND MEASURED					
FRICTION FACTORS FOR TURBULENT FLOW THROUGH	3.658	.014/.079	.008/.014		PIEZOMETRIC TAPPINGS
RECTANGULAR DUCTS					
J HEAT TRANSFER, TASME, FEBRUARY, 1962	1	-	1/9.99		

HEGLY M	61/215	3.04/7.6	.32/.8	2.2/112(-5)	0.15/1.5
THE FLOW OF WATER IN A CHANNEL OF COMPLEX					
CROSS SECTION	41/215	.66/1.65	.12/.5		PITOT TUBE
ANNALES DES PONTS ET CHAUSSES, 23, 1936					
	5.1	.494/.689	1.65/2.75		
HERBICH J B, SHULITS S	16.15	1.676	.3048	3/30(-3)	0.028/0.142
LARGE SCALE ROUGHNESS IN OPEN CHANNEL FLOW					
PASCE, J HYD D, VOL 90, HY6, NOV, 1964	16.15	1.676	.3048		POINT GAUGE
	1	-	3.78/11.96		
HOLLEY E R, ABRAHAM G	-	-	-	-	270/1000
FIELD TESTS ON TRANSVERSE MIXING IN					
RIVERS	8.6 KM	80	4.7		FLUOROMETER
PASCE, J HYD D, VOL 99, HY12, DEC, 1973	10 KM	260	4		
	1	-	8.5/32.5		
HOLLEY I R, ABRAHAM G	16.5	2.2	-	-	0.014
LABORATORY STUDIES ON TRANSVERSE MIXING					
IN RIVERS	16.5	1.2/2.2	-		FLUOROMETER
DELFT PUBLICATION NO 127, JUNE 1974					
	1	-	6/6.19		
HOLLEY E R, KARELSE	22/35.9	1.22/2.62	-	-	0.0141/0.04
MODEL PROTOTYPE COMPARISON FOR TRANSVERSE	(1.1/10 KM)				
MIXING IN RIVERS	22/35.9	1.22/2.62	-		FLUOROMETER
DELFT PUBLICATION NO 116, MARCH 1974	(1.1/10 KM)				
	1	-	-		
HOOKE R L	20	1	-	1.01/2.21(-3)	0.01/0.0505
SHEAR STRESS AND SEDIMENT DISTRIBUTION					
IN A MEANDER BEND	13.2	1	0.132		POINT GAUGE
UPPSALA UNIVERSITY, REPORT 30, 1974					PRESTON TUBE
	1	-	3.9/9.6		STATIC TUBES
					TRANSDUCER

HULSING H, SMITH W, COBB E D VELOCITY HEAD COEFFICIENTS IN OPEN CHANNELS	-	-	-	-	0.031/18012
US GEOLOGICAL SURVEY WATER SUPPLY PAPER 1869 C, 1966	-	1.07/1228	-		CURRENT METER
	1	-	3.28/135		
HUMPHREY J A C, WHITELAW J H, YEE G TURBULENT FLOW IN A SQUARE DUCT WITH	3.145	0.04	0.04	-	0.00142
STRONG CURVATURE J FLUID MECH, 1981, VOL 103	3.145	0.04	0.04		LASER DOPPLER ANEMOMETER
	1	-	1		
HWANG L S, LAURSEN E M SHEAR MEASUREMENT TECHNIQUES FOR	12.19	.146D	-	-	-
ROUGH SURFACES PASCE, J HYD D, VOL 89, HY2, MARCH,	12.19	.146D	-		PRESTON TUBE
1963	-	-	-		
IKEDA S ON SECONDARY FLOW AND BED PROFILE IN	2.4	1	-	-	0.025
ALLUVIAL CURVED OPEN CHANNEL IAHR, 1975, SAO PAULO, VOL 2, PAPER B14	2.4	1	-		PITOT TUBE
	1	-	8.6/9.6		
IKEDA S SELF FORMED STRAIGHT CHANNELS IN SANDY BEDS	2/15	0.3/0.5	-	1.818/5(-3)	5.3/126(-4)
PASCE, J HYD D, VOL 107, HY4, APRIL, 1981	2/15	0.3/0.5	-		PITOT TUBE POINT GAUGE
	1	-	3.80/10.37		
IMAMOTO H, ISHIGAKI T THE THREE DIMENSIONAL STRUCTURE OF TURBULENT	6/8	.2/.4	.15/.23	7.69/20(-4)	1.473/4.354(-3)
SHEAR FLOW IN AN OPEN CHANNEL 5 TH CONG., IAHR, ASIAN & PACIFIC REG. DIV.,	6/8	.2/.4	.15/.23		LASER DOPPLER ANEMOMETER
AUGUST, 1986	1	-	2.513/5.033		

INDLEKOFER H, ROBINSON S, ROUVE G	8	0.03/0.25	-	-	0.004/0.018
ON THE TRANSPORT OF BED LOAD INTO CHANNEL					
BRANCHES AND REGULATION BY INDUCING ARTIFICIAL	4	0.03/0.25	-	-	POINT GAUGE
SECONDARY FLOW					
9 TH CONG., INT. COMMISSION ON IRRIGATION AND	1	-	.217/1.179		
DRAINAGE					
VAN INGEN C	13	0.267	0.254	-1/+38(-3)	0.01294
OBSERVATIONS IN SEDIMENT LADEN FLOW BY USE					
OF LASER DOPPLER VELOCIMETRY	13	0.267	0.254		LASER DOPPLER ANEMOMETER
CALIFORNIA INSTITUTE OF TECHNOLOGY					
KH-R-42, OCT, 1981	1	-	1.77		
IPPEN A T, DRINKER P A	10.973	1.524	-	6.4(-4)	.0054/.081
BOUNDARY SHEAR STRESSES IN CURVED					
TRAPEZOIDAL CHANNELS	10.973	.305/.61	.127/.203		PRESTON TUBE
PASCE, J HYD D, VOL 88, HY5, SEPT, 1962					PITOT TUBE
	1	-	1.51/4.03		POINT GAUGES
					MANOMETERS
JAMES C S	10	0.38	-	4(-3)	0.0083/0.0219
SEDIMENT TRANSFER TO OVERBANK SECTIONS					
J HYDRAULIC RESEARCH, VOL 23, 1985, NO 5	10	0.16	0.105		-
	2.375	.125/.276	1.52		
JAMES M, BROWN B J	26.82	1.524	0.457	1/3(-3)	.0029/.019
GEOMETRIC PARAMETERS THAT INFLUENCE					
FLOODPLAIN FLOW	3/27	.15/.243	.05/.102		VENTURI METER
USWES, RESEARCH REPORT H-77-1, JUNE, 1977					POINT GAUGE
	1/8.00	.002/.419	0.875/1.75		PITOT TUBE
					TRANSDUCER
					CAMERA
JOBSON H E, SAYRE W W	60.96	2.438	1.219	5/47(-4)	0.282/0.867
VERTICAL TRANSFER IN OPEN CHANNEL FLOW					
PASCE, J HYD D, VOL 96, HY3, MARCH, 1970	60.96	2.438	1.219		FLUOROMETER
					DYE
	1	-	2.965/3.056		

JOHNSON J W	16.00	0.406	0.559	1(-2)	-
THE IMPORTANCE OF CONSIDERING SIDE WALL					
FRICTION IN BED LOAD INVESTIGATION	16.00	0.406	0.559		-
CIVIL ENGINEERING, VOL 12, 6, JUNE, 1942					
	1	-	1/4		
JURISCH R	-	5	-	-	-
INSTANTANEOUS VELOCITY MEASUREMENTS					
IN HYDRAULIC MODELS BY LASER DOPPLER	-	5	-		LASER DOPPLER ANEMOMETER
ANEMOMETRY					
IAHR, 15TH CONGRESS, ISTANBUL, 1973	1	-	31.25		
KALKWIJK J P Th,de VRIEND H J	118	6	-	-	0.212/0.463
COMPUTATION OF THE FLOW IN SHALLOW					
RIVER BENDS	118	6	-		-
DELFT UNIVERSITY OF TECHNOLOGY,REPORT 80-1					
	1	-	-		
KARASEV I F	-	.4/1.21	.04/.12	1.7/300(-4)	-
INFLUENCE OF THE BANKS AND FLOODPLAIN ON					
CHANNEL CONVEYANCE	-	25/110	1.6/5.4		-
SOVIET HYDROLOGY, 5, 1969					
	1.5/16	.33/.5	3.33/11.7		
KARTHA V C, LEUTHEUSSER H J	15.24	.387	.61	-	-
DISTRIBUTION OF TRACTIVE FORCE IN					
OPEN CHANNELS	10.97	.387	.61		PRESTON TUBE
PASCE, J HYD D, VOL 96, HY7, JULY, 1970					PRESSURE TAPPINGS
	1	-	.5/6.25		FLOWMETER ADJ. WEIR POINT GAUGE
KAZEMIPOUR A K, APELT C J	25	1.2	-	5.7/60.6(-4)	0.00612/0.05578
NEW DATA ON SHAPE EFFECTS IN SMOOTH					
RECTANGULAR CHANNELS	20	0.4	0.3		ADJ. TAILGATE
J HYDRAULIC RESEARCH, 20, 1982, NO 3					SLUICE GATE
	1	-	0.82/7.35		POINT GAUGES ORIFICE

KELLER R J, RODI W	-	1.22	-	4.8/9.4(-4)	0.0091/0.03
PREDICTION OF TWO DIMENSIONAL FLOW					
CHARACTERISTICS IN COMPLEX CHANNEL CROSS	-	0.204/0.71	.0826/.0975		-
SECTIONS					
HYDROSOFT, 1984	1.7/6	0.8	1.23/7.29		
KIKKAWA H, IKEDA S, KITAGAWA A	21.629	1	-	2(-3)	0.02/0.03
FLOW AND BED TOPOGRAPHY IN CURVED OPEN					
CHANNELS	21.629	1	-		PITOT TUBE
PASCE, J HYD D, VOL 102, HY9, SEPT, 1976					WEIR
	1	-	7.95/10		ADJ. TAILGATE
KIM H T, KLINE S J, REYNOLDS W C	-	0.914	0.254	-	-
THE PRODUCTION OF TURBULENCE NEAR A SMOOTH					
WALL IN A TURBULENT BOUNDARY LAYER	-	0.914	0.254		HOT WIRE ANEMOMETER
J FLUID MECH, 1971, VOL 50, 1					HYDROGEN BUBBLE
	1	-	-		
KINGHORN F C, McHUGH A, DUNCAN W	11.332	0.203D	-	-	AIR, 7.157/22.06(-4)
AN EXPERIMENTAL COMPARISON OF TWO VELOCITY					
AREA NUMERICAL INTEGRATION TECHNIQUES	0.203	0.203D	-		PITOT TUBE
WATER POWER, SEPTEMBER, 1973					
	-	-	-		
KLAASSEN G J, VAN DER ZWAARD J J	-/100	3/3	-/3	-	0-16
ROUGHNESS COEFFICIENTS OF VEGETATED					
FLOOD PLAINS	20/40	3/3	-/-		CURRENT METER
J HYDRAULIC RESEARCH, 12, 1974, 1					PITOT TUBE
	1	-	8.6		
KNIGHT D W	15	0.46	-	9.58(-4)	0.003/0.1136
BOUNDARY SHEAR IN SMOOTH AND ROUGH					
CHANNELS	15	0.46	-		PRESTON TUBE
PASCE, J HYD D, VOL 107, JULY, 1981					
	1	-	.74/7.5		

KNIGHT D W, DEMETRIOU J D	15	0.61	-	9.66(-4)	0.0048/0.0294
FLOODPLAIN AND MAIN CHANNEL FLOW					
INTERACTION	15	.152	.076		PRESTON TUBE
PASCE, J HYD D, VOL 109, 8, AUG.,					MIN. CURRENT METER
1983	1/4	.1/.5	1		VENTURI
					POINT GAUGES
KNIGHT D W, DEMETRIOU	15	0.61	-	9.	0.0048/0.0294
STAGEELATIONSHIPS FOR					
COMPOUND CHANNELS	15	.152	.0		PRESTON TUBE
SYMPOSIUM, CHANNELS AND CHANNEL CONTROL					MIN. CURRENT METER
STRUCTURES, SOUTHAMPTON, APRIL, 1984	1/4	.1/.5	1		ADJUSTABLE WEIR
KNIGHT D W, DEMETRIOU J D, HAMED M E	15	0.61	-	9.66(-4)	-
HYDRAULIC ANALYSIS OF CHANNELS WITH					
FLOODPLAINS	15	.152	.076		PRESTON TUBE
SYMPOSIUM, HYDRAULIC ASPECT OF FLOODS					MIN. CURRENT METER
AND FLOOD CONTROL, BHRA, LONDON, 1983	1/4	.1/.5	1		
KNIGHT D W, DEMETRIOU J D, HAMED M E	15	0.61	-	9.66(-4)	0.00198/0.02866
BOUNDARY SHEAR IN SMOOTH RECTANGULAR					
CHANNELS	15	.07/.61	-		PRESTON TUBE
PASCE, J HYD D, VOL 110, 4, APRIL, 1984					MIN. CURRENT METER
	1	-	.156/9.56		
KNIGHT D W, HAMED M E	15	0.61	-	9.66(-4)	0.00425/0.0294
BOUNDARY SHEAR IN SYMMETRICAL COMPOUND					
CHANNELS	15	.152	.076		PRESTON TUBE
PASCE, J HYD D, VOL 110, 10, OCT, 1980					MIN. CURRENT METER
	2/4	.1/.5	1		
KNIGHT D W, LAI C J	17	0.38	0.1035	-	AIR
TURBULENT FLOW IN COMPOUND CHANNELS					
AND DUCTS	17	.077	.041/.1035		PITOT TUBE
SYMPOSIUM, REFINED FLOW MODELLING AND					PRESTON TUBE
TURBULENCE MEASUREMENTS, IOWA, SEPT, 1985	1/5	.13/.52	1		

KNIGHT D W, PATEL H S	17	.400	.200	-	AIR
BOUNDARY SHEAR STRESS DISTRIBUTIONS IN					
RECTANGULAR DUCT FLOW	9.25	.165/.4	.04/.165		PRESTON TUBE
REFINED FLOW MODELLING AND TURBULENCE					ORIFICE
MEASUREMENTS, IOWA, SEPT, 1985	1	-	1/10		PRESSURE TAPPINGS
KNIGHT D W, MACDONALD J A	15	0.46	0.38	9.58(-4)	0.003/0.114
OPEN CHANNEL FLOW WITH VARYING BED					
ROUGHNESS	15	0.46	0.38		PRESTON TUBE
PASCE, J HYD D, VOL 105, HY9, SEPT, 1979					MIN. CURRENT METER
	1	-	0.74/7.49		VENTURI
					DALL TUBE
					MANOMETER
KNIGHT D W, MACDONALD J W	15.25	0.46	0.38	9.58(-4)	0/0.180
HYDRAULIC RESISTANCE OF ARTIFICIAL					
STRIP ROUGHNESS	15.25	0.46	0.38		PRESTON TUBE
PASCE, J HYD D, VOL 105, HY6, JUNE, 1979					MIN. CURRENT METER
	1	-	0.74/7.49		VENTURI DALL TUBE
KNIGHT D W, PATEL H S	17	0.4	.165	-	AIR
BOUNDARY SHEAR IN SMOOTH RECTANGULAR					
DUCTS	9.25	.165/.4	.04/.165		PITOT TUBE
PASCE, J HYD D, VOL 111, 1, JAN, 1985					PRESTON TUBE ORIFICE
	1	-	1/10		PRESSURE TAPPINGS
					MANOMETER
KOLOSEUS H J, DAVIDIAN J	9.1/25.9	.61/.76	-	4.3/685(-4)	6.995/503(-4)
FREE SURFACE INSTABILITY CORRELATIONS AND					
ROUGHNESS CONCENTRATION EFFECTS ON FLOW OVER	9.1/25.9	.61/.76	-		POINT GAUGE
HYDRODYNAMICALLY ROUGH SURFACES					PIEZOMETRIC TAPPINGS
US GEOLOGICAL SURVEY WATER SUPPLY PAPER	1	-	2.63/16.95		

KOMATSU T, KOTSUBO H, UMENAGA S	5	0.15	0.4	-	0.001444
CHARACTERISTICS OF LARGE VORTICAL STRUCTURE					
IN A MIXING SHEAR FLOW AND ITS HYDRAULIC ROLES	5	0.15	0.4		HOT FILM ANEMOMETER
5 TH CONG., IAHR, ASIAN & PACIFIC REG. DIV.,					DYE
AUGUST, 1986	1	-	0.83		CAMERA
KOMORA J	-	-	-	-	-
HYDRAULIC RESISTANCE TO FLOW IN CHANNELS					
IAHR, 15TH CONGRESS, ISTANBUL, 1973	-	.1/1.25	-		-
	1	-	.5/4		
KOMORA J	15	0.8/1.25	-	.5/1(-2)	-
DISTRIBUTION OF VELOCITIES AND SHEAR					
STRESSES IN OPEN CHANNELS	15	0.10/1.25	-		-
VYSKUMNY USTAV VODNEHO HOSPODARSTVA,					
BRATISLAVA, 80, 1976	1	-	.38/6		
KONEMANN N	50	1	0.455	.5/2(-3)	.01027/.04358
INTERACTION OF CHANNEL AND FLOODPLAIN					
FLOW UPON RESISTANCE IN COMPOUND CHANNELS	40	0.5	0.05/0.1		LASER DOPPLER ANEM.
INSTITUT FUR WASSERBAU,DARMSTADT,25,1980					HOT FILM ANEMOMETER
	2	.065/.524	5/10		MIN. CURRENT METER
					PITOT TUBE
LANSFORD W M, MITCHELL W D	49.89	1.524	1.448	3(-3)	0.0224/1.144
AN INVESTIGATION OF THE BACKWATER PROFILE					
FOR STEADY FLOW IN PRISMATIC CHANNELS	41.15	1.524	1.448		PITOT TUBE
ILLINOIS UNIVERSITY, ENGINEERING EXPERIMENT					CURRENT METER
STATION, BULLETIN 381, 1949	1	-	0.99/6.48		
LAU Y L, KRISHNAPPAN B G	30.7	0.6	-	-	-
TRANSVERSE DISPERSION IN RECTANGULAR					
CHANNELS	30.7	.3/.6	-		CONDUCTIVITY PROBE
PASCE, J HYD D, VOL 103, HY10, OCT, 1977					TRACER
	1	-	4.31/21.43		

LAUFER J INVESTIGATION OF TURBULENT FLOW IN A TWO DIMENSIONAL CHANNEL NACA, REPORT 1053, 1951	7.01	1.524	.076/.127	-	AIR
	4.877	1.524	.127		HOT WIRE ANEMOMETER PITOT TUBE
	1	-	12		
LAUNDER B E, YING W M SECONDARY FLOWS IN DUCTS OF SQUARE CROSS SECTION J FLUID MECH, 1972, VOL 54, 2	7.01	.102	.102	-	AIR
	7.01	.102	.102		HOT WIRE PROBE PRESSURE TAPPINGS
	1	-	1		
LEUTHEUSSER H J TURBULENT FLOW IN RECTANGULAR DUCTS PASCE, J HYD D, VOL 89, HY3, MAY, 1963	21.95	.076/.229	.076	-	AIR
	15.85	.076/.229	.076		PRESTON TUBE PITOT TUBE MICRO-MANOMETER
	1	-	1/3		
O`LOUGHLIN E M, ANNAMBHOTLA V S S FLOW PHENOMENA NEAR ROUGH BOUNDARIES J HYDRAULIC RESEARCH, VOL 7, 2, 1969	-	0.61	-	-	-
	-	0.61	-		-
	1	-	3.59/6.63		
LU S S, WILLMARTH W W MEASUREMENTS OF THE STRUCTURE OF THE REYNOLDS STRESS IN A TURBULENT BOUNDARY J FLUID MECH, 1973, VOL 60, 3	-	1.524	2.134	-	AIR
	-	1.524	2.134		HOT WIRE ANEMOMETER
	1	-	1.4		
MacMILLAN F A EXPERIMENTS ON PITOT TUBES IN SHEAR FLOW AERONAUTICAL RESEARCH COUNCIL, MIN. OF SUPPLY, 1957	2.26	0.05D	-	-	0.0102/0.0439
	1.83	0.05D	-		PITOT TUBE
	-	-	-		

McKEOGH E J, FRASER S M, ERVINE D A	-	0.14 DIA	0.20	-	-
VELOCITY AND TURBULENCE MEASUREMENTS					
IN AIR/WATER FLOWS USING LASER DOPPLER	-	0.14 DIA	0.20		LASER DOPPLER
ANEMOMETRY					ANEMOMETER
IAHR, 1983, MOSCOW, VOL 3, SEPT, 20 TH CONG	-	-	-		
McQUIVEY R S, KEEFER T N	42.7	1.18	0.61	.12/.47(-3)	.091/.11
MEASUREMENT OF VELOCITY CONCENTRATION					
COVARIANCE	42.7	1.18	0.61		HOT FILM ANEMOMETER
PASCE, J HYD D, VOL 98, HY9, SEPT, 1972					CONDUCTIVITY PROBE
	1	-	2.09/2.28		PITOT TUBE
					TRANSDUCER
McQUIVEY R S, RICHARDSON E V	10	0.20	0.20	3.3/21.1(-2)	0.0012/0.0021
SOME TURBULENCE MEASUREMENTS IN OPEN					
CHANNEL FLOW	10	0.20	0.20		HOT FILM ANEMOMETER
PASCE, J HYD D, VOL 95, HY1, JAN, 1969					PITOT TUBE
	1	-	3/3.185		
MAGGIOLO O J, GUARGA R, BORGHI J	10	0.0635D	-	-	AIR
A NEW METHOD FOR MEASURING SHEAR STRESSES					
IN A HYDRAULICALLY ROUGH FLOW	10	0.0635D	-		PRESTON TUBE
J HYDRAULIC RESEARCH, 8, 1970, 2					PIEZOMETRIC TAPPINGS
	-	-	-		
MELLING A, WHITELAW J H	1.8	0.04	0.041	-	0.0015
TURBULENT FLOW IN A RECTANGULAR DUCT					
J FLUID MECH, 1976, VOL 78, 2	1.8	0.04	0.041		LASER DOPPLER ANEM.
					PRESSURE TAPPINGS
	1	-	1		ORIFICE PLATE
MEYER J	15	1	0.5	-	-
WALL SHEAR STRESS AND VELOCITY DISTRIBUTION					
IN SMOOTH TRIANGULAR CHANNELS (GERMAN)	15	1	0.5		POINT GAUGES
BERLIN TECHNICAL UNIVERSITY, 74, 1971					PRESTON TUBE
	1	-	1		TRANSDUCER
					PITOT TUBE

MILLER A C, RICHARDSON E V	18.29	0.61	-	10.4/296(-4)	0.023/0.061
DIFFUSION AND DISPERSION IN OPEN CHANNEL					
FLOW	18.29	0.61	-		FLUORMETER
PASCE, J HYD D, VOL 100, HY1, JAN, 1974					HOT FILM ANEMOMETER
	1	-	2.26/2.40		
MORRIS H M	58.83	.61/.91D	-	-	-
FLOW IN ROUGH CONDUITS					
TASCE, VOL 120, 1955	58.83	.61/.91D	-		-
	-	-	-		
MULLER A, STUDERUS X	25	0.6	-	1.52(-3)	-
SECONDARY FLOW IN AN OPEN CHANNEL					
IAHR, 1979, CAGLIARI, PROC 18 TH CONG.	25	0.6	-		LASER DOPPLER ANEM.
					HOT FILM ANEM.
	1	-	3.75		
MYERS W R C	9.15	0.61	.178	2.645(-4)	0.0063/0.0182
MOMENTUM TRANSFER IN A COMPOUND CHANNEL					
J HYD RESEARCH, 16, NO 2, 1978	9.15	.254	.102		PRESTON TUBE
					POINT GAUGE
	2.4	.086/.394	2.49		ADJUSTABLE WEIR
					MANOMETER
MYERS W R C	8	0.755	.254	4/17.3(-4)	0.00045/0.032
FLOW RESISTANCE IN WIDE RECTANGULAR					
CHANNELS	8	.2/.76	.254		VOLUMETRIC
PASCE, J HYD D, VOL 108, HY4, APRIL, 1982					VENTURI
	1	-	.5/17.86		POINT GAUGE
					ADJUSTABLE WEIR
MYERS W R C	8	.52/.76	.254	2.7/22.8-4	0.0032/0.0345
FLOW RESISTANCE IN SMOOTH COMPOUND CHANNELS					
EXPERIMENTAL DATA	8	0.160	.08/.12		MIN. CURRENT METER
UNIVERSITY OF ULSTER, MARCH, 1985					POINT GAUGE
	3.2/4.7	.10/.53	.66/.99		VENTURI
					MANOMETER

MYERS W R C FRICTIONAL RESISTANCE IN CHANNELS WITH	8	.52/.76	.254	2.7/22.8(-4)	0.0032/0.0345
FLOODPLAINS ULSTER POLYTECHNIC	8	.160	.08/.12		MIN. CURRENT METER POINT GAUGE
	3.2/4.7	.10/.53	.66/.99		VENTURI MANOMETER
MYERS R C, ELSAWY E M BOUNDARY SHEAR IN CHANNEL WITH FLOODPLAIN	11	0.61	0.178	2.65(-4)	0.0064/0.018
PASCE, J HYD D, VOL 101, HY7, JULY, 1975	11	.254	.102		PRESTON TUBE MANOMETER
	1/2.4	.088/.398	2.5		POINT GAUGE ADJUSTABLE WEIR
NAKAGAWA H, NEZU I, TOMINAGA A TURBULENT STRUCTURE WITH LONGITUDINAL	6	0.18	0.08	-	AIR
SECONDARY FLOW J HYDROSCIENCE & HYDRAULIC ENGINEERING	6	0.18	0.08		HOT WIRE ANEMOMETER
, VOL 1, NO 1, APRIL 1983	1	-	2.25		
NAKAGAWA H, NEZU I, UEDA H TURBULENCE OF OPEN CHANNEL FLOW OVER	15	0.5	-	0.8/2.77(-4)	0.00521/0.00614
SMOOTH AND ROUGH BEDS PROC. JSCE, 241, SEPTEMBER, 1975	15	0.5	-		HOT FILM ANEMOMETER PITOT TUBE
	1	-	3.15/3.28		
NALLURI C, ADEPOJU B A SHAPE EFFECTS ON RESISTANCE TO FLOW IN	15	0.305D	-	9.9/360(-5)	-
SMOOTH CHANNELS OF CIRCULAR CROSS SECTION J HYDRAULIC RESEARCH, 23, 1985, 1	15	0.305D	-		POINT GAUGE
	-	-	-		
NALLURI C, NOVAK P TURBULENCE CHARACTERISTICS IN A SMOOTH	8	0.305D	-	0.66/6.12(-4)	-
OPEN CHANNEL OF CIRCULAR CROSS SECTION J HYDRAULIC RESEARCH, 11, 1973, 4	8	0.305D	-		HOT FILM ANEMOMETER MIN. CURRENT METERS
	-	-	-		

NECE R E, GIVLER C A, DRINKER P A	10.84	1.423	0.204	6.25(-4)	0/0.071
MEASUREMENT OF BOUNDARY SHEAR STRESS IN					
AN OPEN CHANNEL CURVE WITH A SURFACE	10.84	1.423	0.204		SURFACE PITOT TUBE
PITOT TUBE					
MASSACHUSETTS INSTITUTE OF TECHNOLOGY,	1	-	3.108		
NECE R E, SMITH J D	-	-	-	-	-
BOUNDARY SHEAR STRESS IN RIVERS AND					
ESTUARIES	-	130	-		PRESTON TUBE
PASCE, J WATERWAYS & HARBOURS, VOL 96, WW2,					MIN. CURRENT METERS
MAY, 1970	1	-	-		
NEZU I, NAKAGAWA H	6	0.18	0.08	-	AIR
CELLULAR SECONDARY CURRENTS IN STRAIGHT					
CONDUIT	6	0.18	0.08		HOT WIRE ANEMOMETER
PASCE, J HYD D, VOL 110, HY2, FEB, 1984					
	1	-	2.25		
NEZU I, RODI W	20	0.60	0.65	1/40.9(-4)	.0046/.0744
OPEN CHANNEL FLOW MEASUREMENTS WITH A					
LASER DOPPLER ANEMOMETER	20	0.60	0.65		LASER DOPPLER ANEM
PASCE, J HYD D, VOL 112, HY5, MAY, 1986					
NICOLLET G, UAN M	-	50/206	-	5/10(-4)	1.235/9.17
CONTINUOUS FREE SURFACE FLOW OVER					
COMPOSITE BEDS	-	50	8/14		-
LA HOUILLE BLANCHE, 1, 1979					
	1/4	.55/.57	1.79/6.25		
NOUTSOPOULOS G, HADJIPANOS P	10.75/15	1/1.21	-	-	0.009/0.03
DISCHARGE COMPUTATIONS IN COMPOUND					
CHANNELS	10.75/15	.15/.29	.075/.12		PRESTON TUBE
IAHR, 1983, MOSCOW, PROC 20 TH CONG					
	4.2/6.7	.115/.74	1/1.208		POINT GAUGE ORIFICE METER

ODGAARD A J	25	0.6	-	1.52(-3)	-
SHEAR INDUCED SECONDARY CURRENTS IN					
CHANNEL FLOWS	25	0.6	-		LASER DOPPLER ANEM.
PASCE, J HYD D, VOL 104, HY5, MAY, 1978					HOT FILM ANEMOMETRY
	1	-	3.75		
OKOYE J K	18.3/40	.85/1.1	.305/.61	.126/3.11(-3)	-
CHARACTERISTICS OF TRANSVERSE MIXING					
IN OPEN CHANNEL FLOWS	18.3/40	.85/1.1	.305/.61		CONDUCTIVITY PROBE
CALIFORNIA INSTITUTE TECHNOLOGY					PITOT TUBE
KH R 23	1	-	2.5/27.96		TRANSDUCER
					CAMERA
OWEN					
OPEN CHAN				6.096	POINT GAUGES
TASC 119, 1954					
	1	-/2.5			
PACHECO - CEBALLOS R	-	.3	.296/.2999	-	0.0099/0.07
ENERGY LOSSES AND SHEAR STRESSES IN	-	.3/.61	.043/.076	-	0.0054/0.0572
CHANNEL BENDS	-	.6	.0655/.265	6.7/40(-4)	0.0213/0.059
PASCE, J HYD D, VOL 109, 6, JUNE, 1983					
	1	-	.507/.5		-
	1	-	3.49/5.98		-
	1	-	1.13/4.58		-
PASCHE E, EVERS P, ROUVE G	25.5	1	1	5/10(-4)	-
INVESTIGATIONS ON HYDRAULIC EFFECTS OF					
VEGETATED FLOODPLAINS IN COMPOUND CROSS	25.5	.124/.314	.124		LASER DOPPLER ANEM.
SECTIONS AND THEIR INFLUENCES ON					HYDROGEN BUBBLE TECH.
DISCHARGE CAPACITY	3.185	.449	1/2.5		CAMERA
IAHR, MOSCOW, 1983, 20 TH CONG					
PASCHE E, ROUVE M	25.5	1	1	-	-
OVERBANK FLOW WITH VEGETATIVELY ROUGHENED					
FLOODPLAINS	25.5	.124/.314	.124		LASER DOPPLER ANEM.
PASCE, J HYD D, VOL 111, 9, SEPT, 1985					PRESSURE TAPPINGS
	3.185	.449	1/2.5		PRESTON TUBE
					CAMERA

PATEL V C	17.27	.0127/.2D	-	-	AIR
CALIBRATION OF THE PRESTON TUBE AND					
LIMITATIONS ON ITS USE IN PRESSURE GRADIENTS	1.88	.0127/.2D	-		PRESTON TUBE
J FLUID MECHANICS, VOL 23, 1, 1965					PITOT TUBE
	-	-	-		PIEZOMETRIC TAPPINGS
PATEL V C, HEAD M R	1.8/3.8	.006/.012D	-	-	AIR
SOME OBSERVATIONS ON SKIN FRICTION AND	1.83	0.3048	0.006	-	
VELOCITY PROFILES IN FULLY DEVELOPED PIPE					PITOT TUBE
AND CHANNEL FLOWS	.41/.61	.006/.012D	-		PIEZOMETRIC TAPPINGS
J FLUID MECH, 1969, 38, 1	.41	0.3048	0.006		
	-	-	-		
	1	-	50.8		
PERKINS H J	1.676	0.305	0.305	-	AIR
THE FORMATION OF STREAMWISE VORTICITY					
IN TURBULENT FLOW	1.676	0.305	0.305		HOT WIRE ANEMOMETER
J FLUID MECH., 1970, VOL 44, 4					
	1	-	1		
PETRYK S, GRANT E U	-	-	-	-	113/340
CRITICAL FLOW IN RIVERS WITH FLOODPLAINS					
PASCE, J HYD D, VOL 104, HY5, MAY, 1978	-	25/391	1.83		-
	15.6	0.34	6.8		
POSEY C J	41.15	1.524	-	3(-3)	0.059/1.263
COMPUTATION OF DISCHARGE INCLUDING					
OVERBANK FLOW	41.15	.305	.305		-
ASCE, CIVIL ENGINEERING, APRIL, 1967					
	5	.138/.666	.5		
PRESTON J H	5.4/4.9	.05/.19 DIA	-	-	AIR
THE DETERMINATION OF TURBULENT SKIN FRICTION					
BY MEANS OF PITOT TUBES	.9/1.3	.05/.19 DIA	-		PITOT TUBE
J ROYAL AERONAUTICAL SOC., VOL 58, FEB, 1954					PRESSURE TAPPINGS
	-	-	-		

PRINOS P, TOWNSEND R D	12.2	1.372	0.204	3(-3)	0.0151/0.0328
ESTIMATING DISCHARGE IN COMPOUND OPEN					
CHANNELS	12.2	.406/.508	0.102		PRESTON TUBE
6 TH CANADIAN HYDROTECHNICAL CONFERENCE,					PIEZOMETRIC TAPPINGS
ONTARIO, JUNE, 1983	2.7/3.1	.044/.329	1.99/2.49		STATIC TUBE
PRINOS P, TOWNSEND R D	-	-	-	1(-3)	0.0094/0.0165
PREDICTION OF MAIN CHANNEL/FLOODPLAIN					
FLOW INTERACTION WITH FEM	-	.203/.580	.03/.102		PITOT TUBE
FINITE ELEMENTS IN WATER RESOURCES					MIN. CURRENT METER
PROC 5th INT CONF, BURLINGTON, VERMONT,	2.6/5.3	.16/.55	.995/9.67		
USA, JUNE, 1984					
PRINOS P, TOWNSEND R, TAVOULARIS S	12.2	1.372	0.204	1(-3)	0.0118/0.0325
STRUCTURE OF TURBULENCE IN COMPOUND					
CHANNEL FLOWS	12.2	.508/.580	.030/.102		PITOT TUBE
PASCE, J HYD D, VOL 111, 9, SEPT, 1985					TRANSDUCER
	2.4/2.7	.16/.5	8.47/9.67		PRESTON TUBE
					HOT FILM ANEMOMETER
PRUS- CHACINSKI T M	-	-	-	-	-
HELICAL FLOW IN OPEN CHANNEL BENDS					
THE DOCK AND HARBOUR AUTHORITY, JULY, 1955	-	-	-		POINT GAUGES
	1	-	-		
PYLE R, NOVAK P	12	0.3	-	-	-
COEFFICIENT OF FRICTION IN CONDUITS WITH	5	0.3	-	-	AIR, 0.285
LARGE ROUGHNESS	150	1	-	-	-
J HYDRAULIC RESEARCH, 19, 1981, 2					
	12	0.3	-		HOT FILM ANEMOMETER
	5	0.3	-		LASER DOPPLER ANEMOMETER
	150	1	-		
	1	-	1.875		
	1	-	-		
	1	-	-		

RAJARATNAM N, AHMADI R M INTERACTION BETWEEN MAIN CHANNEL AND FLOODPLAIN FLOWS PASCE, J HYD D, VOL 105, HY5, MAY, 1979	18.29	1.219	.914	.27/1.27(-3)	0.0051/0.057
	18.29	.203	.076/.109		PITOT TUBE PRESTON TUBE
	5.97	.072/.555	0.92/1.34		PRESSURE PROBES TRANSDUCERS POINT GAUGES
RAJARATNAM N, AHMADI R HYDRAULICS OF CHANNELS WITH FLOODPLAINS J HYD RESEARCH, 19, 1, 1981	18.29	1.220	.914	.36/.6(-3)	0.025/0.056
	18.29	.711	.0975		PITOT TUBE PRESTON TUBE
	1.714	.1/.46	7.29		TRANSDUCERS FLOWMETER PRESSURE PROBES
RAJARATNAM N, MURALIDHAR D BOUNDARY SHEAR STRESS DISTRIBUTION IN RECTANGULAR OPEN CHANNELS LA HOUILLE BLANCHE, 6, 1969	9.8/36.6	.23/.9	.2/.76	5.8/19.3(-3)	0.0041/0.203
	9.8/36.6	.076/.9	.2/.76		PIEZOMETERS PITOT TUBE
	1	-	.415/10.14		PRESTON TUBE ORIFICE METER
RAO K N, NARASIMHA R, NARAYANAN M A B THE BURSTING PHENOMENA IN A TURBULENT BOUNDARY LAYER J FLUID MECHANICS, VOL 48, 2, 1971	2.438	0.305	0.305	-	AIR
	2.438	0.305	0.305		PIEZOMETERS PITOT TUBE
	1	-	1		HOT WIRE ANEMOMETER PRESTON TUBE
REPLOGLE J A, CHOW V T TRACTIVE FORCE DISTRIBUTION IN OPEN CHANNELS PASCE, J HYD D, VOL 92, HY2, MARCH, 1966	6.096	.1D/.133D	-	2/8(-3)	7.8/49.8 -4
	6.096	.1D/.133D	-		TAPPING POINTS TOTAL HEAD PROBE
	-	-	-		PITOT TUBE VOLUMETRIC MANOMETER

RICHARDSON E V, McQUIVEY R S MEASUREMENT OF TURBULENCE IN WATER	10	0.2	-	7.7/84.4(-4)	0.0015/0.0038
PASCE, J HYD D, VOL 94, HY2, MARCH, 1968	10	0.2	-		HOT FILM ANEMOMETER PITOT TUBE
	1	-	3.07/3.38		POINT GAUGE
ROBINSON A R, ALBERTSON M L ARTIFICIAL ROUGHNESS STANDARD FOR OPEN	6.096	0.229	0.267	1/40(-3)	-
CHANNELS TRANSACTIONS, AMERICAN GEOPHYSICAL UNION,	4.267	0.229	0.267		POINT GAUGE
	1	-	0.53/2.25		
SARMA K V N, LAKSHMINARAYANA P, LAKSHMANA RAO N S	15.25	0.61	0.30	-	0/0.05
VELOCITY DISTRIBUTION IN SMOOTH RECTANGULAR OPEN CHANNELS	15.25	0.305/0.61	0.30		POINT GAUGE ADJUSTABLE WEIR
PASCE, J HYD D, VOL 109, 2, FEB, 1983	1	-	.5/4		PITOT TUBE MANOMETER
SARMA K V N, SASIKANTH S R EVALUATION OF MANNINGS N FOR STEADY	15.09	0.610	-	4.17(-3)	0.0083/0.054
NON UNIFORM FLOWS PROC 2nd AUSTRALASIAN CONF ON HYDRAULICS	4.6/5.2	0.305	-		POINT GAUGE
AND FLUID MECHANICS	1	-	.247/1.055		
SAYRE W W, CHANG F M A LABORATORY INVESTIGATION OF OPEN CHANNEL	45.72	2.386	0.61	-	-
DISPERSION PROCESSES FOR DISSOLVED, SUSPENDED,AND FLOATING DISPERSANTS	45.72	2.386	0.61		FLUOROMETER MIN CURRENT METER
U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 433 E, 1968	1	-	3.2/8.1		
SAYRE W W, ALBERTSON M L ROUGHNESS SPACING IN RIGID OPEN CHANNELS	21.95	2.438	0.610	1/3(-3)	0.0566/0.1699
TASCE, 1963, VOL 128, 1, PAPER 3417	21.95	2.438	0.61		PITOT TUBE POINT GAUGE
	1	-	4.07/15.75		

SELLIN R H J	4.572	0.457	-	8.5(-4)	2.016/2.478(-3)
A LABORATORY INVESTIGATION INTO THE					
INTERACTION BETWEEN THE FLOW IN THE	4.572	0.114	.0445		PRESSURE TAPPINGS
CHANNEL OF A RIVER AND THAT OVER ITS					PITOT TUBE
FLOODPLAIN	4	0.09/0.34	1.286		MIN. CURRENT METER
LA HOUILLE BLANCHE, 7, 1964					CAMERA
					ADJUSTABLE WEIR
SHIH C C, GRIGG N S	18.29	.254	.254	-	-
A RECONSIDERATION OF THE HYDRAULIC RADIUS					
AS A GEOMETRIC QUANTITY IN OPEN CHANNEL	18.29	.073/.254	.254		ADJ TAILGATE
HYDRAULICS					SLUICE GATE
IAHR, 1967, VOL 1, 12 TH CONG, A36	1	-	.25/5		VOLUMETRIC TANK
					ORIFICE
					POINT GAUGES
SHUKRY A	9.2/9.9	0.3	0.4	-	0.07
FLOWS AROUND BENDS IN AN OPEN FLUME					
TASCE, VOL 115, 1950, PAPER 2411	9.2/9.9	0.3	0.4		PITOT SPHERE
	1	-	.455/.48		
SIEBERT W, GOTZ W	41.7	1	-	-	-
A STUDY ON THE DEFORMATION OF SECONDARY					
FLOW IN MODELS OF RECTANGULAR MEANDERING	41.7	1	-		HOT FILM ANEMOMETER
CHANNELS					
IAHR, 1975, SAO PAULO, VOL 2, PAPER B18	1	-	2.3/10		
SMITH C D	24	1.2	-	1(-3)	0.0027/0.047
EFFECT OF CHANNEL MEANDERS ON FLOOD STAGE					
IN VALLEY	24	0.12/1.2	0.076		POINT GAUGES
PASCE, J HYD D, VOL 104, HY1, JAN, 1978					
	1/10	.166/.468	.8/5.68		
SOLIMAN M M, TINNEY E R	5.56	.305	.457	-	-
FLOW AROUND 180 DEGREE BEND IN OPEN					
RECTANGULAR CHANNELS	5.56	.305	.457		PITOT TUBE
PASCE, J HYD D, VOL 94, HY4, JULY, 1968					POINT GAUGE
	1	-	.6/.75		DYE
					MICRO MANOMETER

SOOKY A A	7.315	1.185	.152	3-100(-4)	0.0019/0.017
THE FLOW THROUGH A MEANDER FLOODPLAIN					
GEOMETRY	7.315	.209/1.185	.038/.152		PRANDTL TUBE
CIV ENG DEPT, PURDUE UNIV, LAFAYETTE,					OSCILLOSCOPE
INDIANA, USA, 1964	1/5.656	0.091/0.47	.69/2.75		TRANSDUCER
					POINT GAUGE
STEFFLER P M, RAJARATNAM N, PETERSON A W	35	1.14	0.5	2.3/12(-4)	0.032/0.126
LDA MEASUREMENTS IN OPEN CHANNEL					
PASCE, J HYD D, VOL 111, 1, JAN, 1985	35	1.14	0.5		LASER DOPPLER ANEMOMETER
					POINT GAUGE
	1	-	2.53/6.13		
STRAUB L G, SILBERMAN E, NELSON H C	4.6/6.7	-	-	1/10(-3)	-
OPEN CHANNEL FLOW AT SMALL REYNOLDS					
NUMBERS	4.6/6.7	-	-		PITOT TUBE
TASCE, VOL 123, 1958, PAPER 2935					POINT GAUGE
	1	-	.577/6.05		
SUMER B M,DEIGAARD R	10	0.3	0.3	-	-
EXPERIMENTAL INVESTIGATION OF MOTIONS					
OF SUSPENDED HEAVY PARTICLES AND THE	2.5	0.3	0.3		MIN CURRENT METER
BURSTING PROCESS					POINT GAUGES
TECHNICAL UNIVERSITY OF DENMARK,23,NOV,1979	1	-	2.21		CAMERA
					ORIFICE PLATE
TAMAI N, HIROSAWA Y	-	-	-	-	-
A FIELD OBSERVATION OF THE TRANSVERSE					
VARIATION OF SHEAR AND DIFFUSIVITY IN THE	2/3 2	47	-		CURRENT METER
TAMA RIVER,TOKYO					E.M. CURRENT METER
5 TH CONG., IAHR, ASIAN & PACIFIC REG. DIV.,	1	-	21.9/39.2		DYE
TAMAI N, IKEUCHI K, YAMAZAKI A, MOHAMED A A	19.41	0.30	-	1(-3)	-
EXPERIMENTAL ANALYSIS ON THE OPEN CHANNEL					
FLOW IN RECTANGULAR CONTINUOUS BEND	10.607	0.30	-		STATIC TUBE
J HYDROSCIENCE AND HYDRAULIC ENGINEERING,					POINT GAUGE
VOL 1/2, NOVEMBER, 1983	1	-	5		MIN CURRENT METER

TAMAI N, IKEYA T THREE DIMENSIONAL FLOW OVER ALTERNATING POINT BARS IN A MEANDERING CHANNEL J HYDROSCIENCE AND HYDRAULIC ENGINEERING, VOL 3/1, APRIL, 1985	9.60	0.20	-	1(-3)	0.003
	1.60	0.20	-		HOT FILM ANEMOMETER POINT GAUGE
	1	-	1.92		
TAYLOR R H EXPLORATORY STUDIES OF OPEN CHANNEL FLOW OVER BOUNDARIES OF LATERALLY VARYING ROUGHNESS CALIFORNIA INSTITUTE OF TECHNOLOGY REPORT KH - R -4, JULY, 1961	12.19	0.267	0.254	.64/32.65(-3)	-
	12.19	0.267	0.254		MIN CURRENT METER POINT GAUGE
	1	-	.96/3.44		VENTURI METER
TOEBES G H, SOOKY A A HYDRAULICS OF MEANDERING RIVERS WITH FLOODPLAINS PASCE, J W H D, VOL 93, WW2, MAY, 1967	7.315	1.185	-	3/100(-4)	0.0059/0.0127
	7.315	.209/1.185	0.038/0.152		POINT GAUGE PITOT TUBE
	1/5.656	0.091/0.47	0.69/2.75		TRANSDUCER
TOWNSEND D R AN INVESTIGATION OF TURBULENCE CHARACTERISTICS IN A RIVER MODEL OF COMPLEX CROSS SECTION PICE, VOL 40, 7091, JUNE, 1968	9.144	0.61	0.152	-	-
	9.144	.254	.102		HOT FILM ANEMOMETER PITOT TUBE
	2.4	0.07/0.2	2.5		CAMERA DYE
TRACY H J TURBULENT FLOW IN A THREE DIMENSIONAL CHANNEL PASCE, J HYD D, VOL 91, HY6, NOV, 1965	8.839	0.813	0.127	-	AIR
	8.839	0.813	0.127		PRESSURE TAPPINGS HOT FILM ANEMOMETER
	1	-	6.4		MICROMANOMETER
TRACY H J THE STRUCTURE OF A TURBULENT FLOW IN A CHANNEL OF COMPLEX SHAPE GEOLOGICAL SURVEY PROFESSIONAL PAPER 983	25.6	.31	.51	-	AIR
	25.6	.31	.105		HOT WIRE ANEMOMETER
	1.65	.33	2.95		

TRACY H J, LESTER C M	24.38	1.067	.457	.7/331(-4)	0.0085/0.207
RESISTANCE COEFFICIENTS AND VELOCITY					
DISTRIBUTION,SMOOTH RECTANGULAR CHANNEL	24.38	1.067	.457		POINT GAUGES
GEOLOGICAL SURVEY WATER SUPPLY PAPER					PIEZOMETRIC TAPPINGS
1592-A	1	-	3.5/17.5		VENTURI
					ORIFICE
TRESKE A	210	5.75/7	0.52/0.82	1.4/2.4(-4)	0.004/0.464
EXPERIMENTAL TESTING OF A 1D MATHEMATICAL					
MODEL USED TO SIMULATE UNSTEADY FLOODFLOWS	210	1/1.25	0.3/0.39		POINT GAUGES
MUNICH TECHNICAL UNIVERSITY,44,1980					
	4.6/7	.002/.349	1.6/1.67		
TURNER A K, LANGFORD K J, WIN M, CLIFT T R	1.25/20	0.15/4.5	-	2.5/7.6(-3)	0.0001/0.007
DISCHARGE DEPTH EQUATION FOR SHALLOW FLOW					
PASCE, J I D D, VOL 104, IR 1, MARCH, 1978	1.25/20	0.15/4.5	-		PIEZOMETERS
					POINT GAUGE
	1	-	-		
UNITED STATES WATERWAYS EXPERIMENTAL STATION	30.48	4.88/9.14	-	1(-3)	0.024/0.464
HYDRAULIC CAPACITY OF MEANDERING CHANNELS IN					
STRAIGHT FLOODWAYS	30.48	.305/.61	0.152		PIEZOMETERS
USWES, TECH MEMO, NO 2-429, MARCH, 1956					
	8/30	.166/.375	1/2		
UTAMI T, UENO T	12	0.4	-	1(-3)	-
VISUALIZATION AND PICTURE PROCESSING					
OF TURBULENT FLOW	12	0.4	0.041		CAMERA
EXPERIMENTS IN FLUIDS, 2, 1984					
	1	-	4.88		
VARSHNEY D V, GARDE R J	12/16	.61	.762	6.7/40(-4)	0.0213/0.059
SHEAR DISTRIBUTION IN BENDS IN					
RECTANGULAR CHANNELS	12/16	.61	.762		PRESTON TUBE
PASCE, J HYD D, VOL 101, HY8, AUG, 1975					
	1	-	1.13/4.58		

VREUGDENHIL C B,WIJBENGA J H A	-	-	-	-	2000/3750
COMPUTATION OF FLOW PATTERNS IN RIVERS					
PASCE,J HYD D,VOL 108,HY11,NOV,1982	7000	200,400	9		POINT GAUGES MIN CURRENT METER
	2.75	0.053	-		
de VRIEND H J,STRUIKSMA N	47.32	1.5	-	-	0.047/0.061
FLOW AND BED DEFORMATION IN RIVER BENDS					
DELFT HYDRAULICS LABORATORY,317,DEC,1983	47.32	1.5	0.08/0.1		MIN CURRENT METER
	-	-	7.5/9.38		
de VRIEND H J,GELDOF H J	-	-	-	6.03/6.95(-4)	1.21/1.53
MAIN FLOW VELOCITY IN SHORT AND SHARPLY					
CURVED RIVER BENDS	285	6.1	0.5		CURRENT METER
DELFT UNIVERSITY OF TECHNOLOGY,REPORT 83-6					
	-	-	6.1		
WALLACE J M, BRODKEY					
TURBULENT SHEAR FLOWS	-	0.22	-		HOT FILM ANEMOMETER
J FLUID MECH, VOL 83, 4, DEC, 1977					
	-	-	-		
WATTS F J, SIMONS D B, RICHARDSON E V	126/958	2.13/3.66	-	2/13(-4)	4.19/37.5
VARIATION OF ALPHA AND BETA VALUES IN A					
LINED OPEN CHANNEL	44/75	2.13/3.66	-		CURRENT METERS
PASCE, J HYD D, VOL 93, HY6, NOV, 1967					
	1	-	.46/2.67		
WHITE W R, WHITEHEAD E	10	0.102	0.203	-	-
THE PERFORMANCE OF PIEZOMETRIC TAPPINGS					
HYD RES STN, INT 98, DEC, 1971	10	0.102	0.203		PRESTON TUBE
	1	-	0.5		

WORMLEATON P R, ALLEN J, HADJIPANOS P THE EFFECTS OF THE SPACING OF	6	0.3	-	4.3/25.8(-4)	0.00065/0.01245
HEMISPHERICAL ELEMENTS ON THE HYDRAULIC RESISTANCE OF OPEN CHANNELS	6	0.3	-		POINT GAUGE VOLUMETRIC
17 TH CONVENTION ON HYDRAULICS AND HYDRAULIC CONSTRUCTION, PALERMO, 1980	1	-	1.316/6.25		ADJUSTABLE WEIR
WORMLEATON P R, ALLEN J, HADJIPANOS P DISCHARGE ASSESSMENT IN COMPOUND	10.75	1.21	0.40	4.3/18(-4)	0.009/0.048
CHANNEL FLOW PASCE, J HYD D, VOL 108, HY9, SEPT, 1982	10.75	0.29	0.12		PRESTON TUBE ADJUSTABLE WEIR
	4.17	.111/.429	1.208		POINT GAUGE DALL TUBE MANOMETER
WORMLEATON P R, HADJIPANOS P FLOW DISTRIBUTION IN COMPOUND CHANNELS	10.75	1.21	0.4	-	-
PASCE, J HYD D, VOL 111, 2, FEB, 1985	10.75	0.29	0.12		MIN. CURRENT METER ADJUSTABLE WEIR
	4.17	-	1.208		POINT GAUGE DALL TUBE
WOERNER J L, JONES B A, FENZL R N LAMINAR FLOW IN FINITELY WIDE RECTANGULAR	6.096	0.255	0.508	1.23/6.83(-4)	8.24/34579 -6
CHANNELS PASCE, J HYD D, VOL 94, HY3, MAY, 1968	1.829	0.05/0.255	0.152		PITOT TUBE PIEZOMETRIC TAPPINGS
	1	-	1.53/19.05		POINT GAUGE
WRIGHT R R, CARSTENS M R LINEAR MOMENTUM FLUX TO OVERBANK	6.096	.254	.076/.127	-	AIR
SECTIONS PASCE, J HYD D, VOL 96, HY9, SEPT, 1970	6.096	.127	0.0254		PRESSURE TAPPINGS PRESTON TUBE
	2	.33/.6	5		TRANSDUCER MANOMETER PITOT TUBE

YEN C L, OVERTON D E SHAPE EFFECTS ON RESISTANCE IN FLOOD	-	.914/1.83	-	1.4/3.5(-3)	0.15/0.316
PLAIN CHANNELS PASCE, J HYD D, VOL 99, HY1, JAN, 1973	-	0.283	0.183/0.427		-
	3.2/6.5	.255/.474	0.33/0.78		
YEN C L, YEN B C WATER SURFACE CONFIGURATION IN CHANNEL	31.09	2.33	-	-	-
BENDS PASCE, J HYD D, VOL 97, HY2, FEB, 1971	31.09	1.83/2.33	-		-
	1	-	-		
YOON S E, LEE J T, LEE W H FLOW CHARACTERISTICS IN SHALLOW CHANNEL	25.76	1.7	0.18	-	0.187
BENDS 5 TH CONGRESS, ASIAN & PACIFIC REG. DIV.	13.35	1.7	0.18		-
	1	-	4.72		
ZHELEZNYAKOV G V RELATIVE DEFICIT OF MEAN VELOCITY OF	-	1.35/6.36	-	5/10(-4)	0.0069/0.0514
UNSTABLE RIVER FLOW,KINEMATIC EFFECT IN RIVER BEDS WITH FLOODPLAINS	-	.45/0.60	0.06		
IAHR, 1965, LENINGRAD, PROC 11TH CONG	3/11.64	.14/.4	3.75/5		
AGASIEVA S I, BAREKYAN A S CHANGE IN THE MEAN VELOCITIES IN MAIN	-	6.16/21.42	-	3(-4)	0.017/0.190
BED AND CHEZYS COEFFICIENT DURING FLOODWATER	-	1.21/2.10	-		
METEOROLOGIA i GEOLOGIA, NO 9, 1961	5.1/10.1	-	-		
SPITSIN I P ON THE INTERACTION OF THE STREAMS OF	-	1.92/2.06	-	3(-3)	0.002/0.1
THE MAIN RIVER BED AND THE FLOODPLAIN METEOROLOGIA i GEOLOGIA, NO 10, 1962	-	0.20/0.40	-		
	5.2/9.6	.03/.515	3.17/6.35		

ZHELEZNYAKOV G V	-	3.5	-	-	0/0.120
INTERACTION OF CHANNEL AND FLOODPLAIN					
STREAMS	-	0.3	-		
IAHR, 1971, PARIS,					
	11.67	-	-		
ZHELEZNYAKOV G V, NOVIKOVA N M	14.3/23	.98/3.88	-	1(-3)	0.0025/0.133
KINEMATIC EFFECT OF THE FLOW IN					
ERODIBLE CHANNELS	14.3/23	.35/2.62	0.26/0.48		THERMOHYDROMETER
IAHR, 1973, ISTANBUL, PROC 15 TH CONG					TRANSDUCER
	1.5/2.8	.031/.195	0.83/10.08		